THE AMERICAN PEOPLES ENCYCLOPEDIA

Abélard
TEACHING IN SCHOOL
WHICH GREW INTO THE
UNIVERSITY OF PARIS
ABOUT 1108

ABÉLARD: LORD OF LOVE AND LEARNING

Romantic Hero Who Started University of Paris

In modern times Peter Abélard (1079-1142), whose real name was Pierre de Palais, has been known chiefly as the unfortunate hero of a beautiful but tragic love relationship with the sublimely devoted Héloïse. Their fortitude in the face of a gruesome ordeal has touched the hearts of generations of readers. And the poignancy of this tragedy is deepened by Abélard's eminence as a thinker and teacher, a moral and intellectual leader.

His career as a teacher began when he was in his early twenties and continued until nearly the end of his life. About 1100, at the age of 20, he came to Paris for the first time. He entered the episcopal school of the cloister of Notre Dame, where he attended the lectures of William of Champeaux, leading exponent of the type of philosophical realism then current. Before long, however, he broke with this teacher and attacked his doctrines publicly.

In 1102 he established his own school at Melun, 25 miles from Paris, and a short time later another one at Corbeil, nearer the great city. Full of youthful confidence, he announced that he would remain there only until he was in a position to "pitch his camp" on the heights of Sainte Geneviève, in Paris, the "hill destined to become the Sinai of university instruction."

In 1107 or 1108 Abélard made good his boast of a few years earlier. He established himself as an instructor on the Mount of Sainte Geneviève, where schools then existed which competed freely with the official school of the city. This move is commonly regarded as the beginning of the University of Paris, model of most of the other universities of the Middle Ages, though it did not receive a royal charter until nearly 60 years after Abélard's death.

Some have claimed for Charlemagne the honor of starting this great seat of learning, when in 780 he had Alcuin open the first cloister school connected with the Notre Dame Cathedral. But most historians regard this claim as farfetched.

Abélard played a leading role in the establishment of the scholastic manner of philosophizing, and thus helped make possible the logical presentation of religious doctrine. His other major contribution in the field of philosophy was an emphasis on the importance of intention in conduct. He maintained that the moral value of any individual's action depends upon the intention back of it.

At the height of his career there were more than 5,000 students in his school and he was the most famous teacher in Europe. See Abélard, Pierre; Education, History of, *Revivals of Learning;* Paris, University of; William of Champeaux.

The American Peoples
ENCYCLOPEDIA

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CONCESSION is a privilege or right, usually economic, granted by a government to a foreign government, company, or an individual. Such grants can assume forms of franchise, license, patent, charter, monopoly, approbation or admission, but in international law all such authorizations of economic activities are concessions. In some countries a concession may also be the permission required in order that the government may examine the qualifications of the local applicant and his enterprise. In the United States, however, concession is generally reserved for the rights existing abroad. Since concessions granted to foreigners usually concern economic activities of public or semi-public character and thus have a special connection with the national interest of the granting country, most countries are reluctant to make such grants. This is particularly true in cases where important concessions granted by an underdeveloped country to nationals of a powerful state may open the way for foreign interference and even intervention.

The usual motive on the part of a concessionaire is to secure favorable conditions for the capital invested abroad and to protect the investment from unfair impositions after it promises returns. At the same time the grantee seeks through concession an exemption from taxation and import and export duties. The grantor of the concession may be motivated by the desire to attract the outside capital and industrial skill to develop industry and to exploit the country's natural resources. On the whole, most nations prefer to borrow foreign money to be used by their nationals, rather than granting concessions to foreigners. Concessions may involve a variety of economic activities, such as exploitation of the natural resources (oil, rubber, minerals), manufacturing, import and export, transportation (navigation, railroads, aerial transport).

The grantor of a concession may be any governmental body—a state, province, municipality, or tribal chief. The grantee may be a state, a public or private corporation, or an individual. Where a state is the grantor, it is able to change the terms of a concession through laws by virtue of its sovereignty. Many states have incorporated in their constitutions provision for the cancellation of private rights so as to reserve to themselves the power to nationalize foreign concessions at any time, which places concessions in these countries in a precarious position. Concession may be created by a treaty, a unilateral public act, a contract under private law or under the public law of the granting state. Legal protection to the grantee is strongest where the concession is based on a treaty or a public law contract. In many cases the concession involves both rights and duties, but the grantee is not always under the obligation to exercise the rights conferred by the concession. A concession may be granted for a specific or indefinite period of time, but if it outlasts the political and economic conditions under which it was granted, it creates important problems.

The origin of concessions may be found in the feudal grants of lands and runs. Great geographic discoveries and explorations of the sixteenth and seventeenth centuries and subsequent colonial expansion of the European powers, gave rise to great chartered companies, such as the East India Company, the London Company, and the Hudson's Bay Company, which were granted extensive concessions in land and considerable political powers for administration, settlement, and development of the granted territories. In the industrial era, concessions tended to assume the forms of a contract, losing the old elements of privilege, favor, and secrecy.

Concessions are most numerous in the underdeveloped or colonial areas of the world, particularly in Latin America, Africa, the Middle East, and Southeast Asia. Among the most ancient and most important concessions are those for oil. Great oil concessions have been developed by the American-Arabian Oil Company in Saudi Arabia, the Caribbean Petroleum Company in Central America, the Anglo-Iranian Oil Company in Iran, and the United British West Indies Petroleum Syndicate.

Perhaps the most controversial concessions have been those granted by governments to foreign powers. Important political concessions were granted under duress to European powers and Japan by China at the turn of the last century. While all of them have since been abrogated, the oldest Chinese concession, that of Macao (1557), is still in existence. Other examples of political concessions are those of Guantánamo Bay made by Cuba to the United States in 1899, of Fonseca granted to the United States in 1916 by Nicaragua, and the famous Baghdad Railway concession granted by Turkey to Germany in 1911.

The growth of nationalism and emancipation of the former colonial areas threatened foreign concessions in a number of countries, leading to long international controversies and litigations. Thus the 1937 nationalization of the oil industry by Mexico affected 17 British and American companies with investments of about $450 million. In 1951 Iran nationalized the assets of the Anglo-Iranian Oil Company, which lead to a prolonged controversy with Great Britain; after the overthrow of the Mossadegh government a new agreement was concluded in 1954 between Iran and eight foreign oil companies providing them with oil concessions on terms more advantageous to Iran. See IMPERIALISM; COLONIAL SYSTEM; SPHERE OF INFLUENCE.

ROLLINS COLLEGE

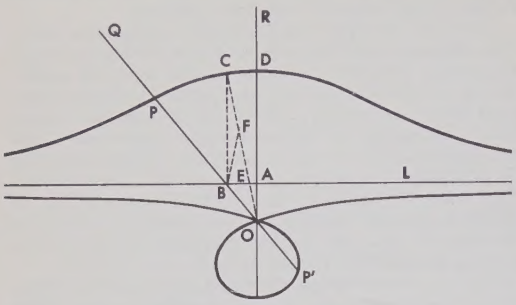
These fine shells, examples of the giant or queen conch, *Strombus gigas*, and found from Florida to the West Indies, are collected by divers for use in the making of cameos.

CONCH is a large marine snail belonging to the *Strombidae* family of gastropods. (See GASTROPODA; SNAIL.) These snails live in warm seas where they feed upon dead crabs and mollusks. The eyes of the conch develop at the tips of its tentacles. It is able to carry its heavy shell about because of its muscular body and its strong, well-developed foot. The conch's porcelain-like shell is thick, with an enlarged body whorl and a cone-shaped spire at one end. The shell opening is elongated, with a stationary flaring lip. To close the opening the snail must enter the shell head first; its large foot then acts as a door. The giant, or queen, conch, *Strombus gigas*, is found from Florida to the West Indies. One of the largest of the gastropods, it may have a shell 10 inches long and weigh five pounds. The nodular outer surface of the shell is yellowish buff, the smooth interior rosy pink. The flesh of this conch is used as food and its sheli, once common as a door stop, is used commercially for cameos; the resulting scrap material is used in making porcelain.

CONCHAS DAM. See CANADIAN RIVER.

CONCHOID, a curve invented by the geometer Nicomedes (c. 180 B.C.) for trisecting an angle. The

trisection of an angle was a famous problem that the early Greeks tried to solve by use of straightedge and compass only, and is now known to be insoluble



Construction of a Conchoid

by those means. The conchoid may be constructed as follows. Let O be a fixed point at a distance d $(=OA)$ from a fixed line L. Through O draw a straight line intersecting L in point B, and lay off along OB, in both directions from B, a line segment of length a. The ends P and P' of these line segments are two points on the conchoid, with $BP=BP'=a$. In the same way, every line through O that intersects L can be made to yield two points on the conchoid. The curve thus has two branches, each of which is symmetrical about a line through O perpendicular to L, and which has the line L for an asymptote (see ASYMPTOTE). At O one branch has a loop if a is greater than d, as in the figure, or a cusp if $a=d$. If a is less than d, the branch does not pass through O.

Trisection of an Angle. Suppose $\angle ROQ$ is to be trisected. From any point B on OQ, drop a line BA perpendicular to OR. Using O as the fixed point and BA extended as the fixed line, construct a conchoid for which $a=2\cdot OB$. At B erect a perpendicular to BA, meeting the conchoid in C. Draw CO, intersecting L in point E. That $\angle ROC$ is the required one-third of $\angle ROQ$ can be proved as follows. If F is the midpoint of CE, then $CF=EF=BF$. Since $EC=2\cdot OB$, from the construction of the conchoid, and since $EC=2\cdot EF=2\cdot BF$, it follows that $OB=BF$. The triangle OBF is therefore isosceles and $\angle BOF=\angle BFO$. Since $\angle BFO$ is the sum of the two equal angles, $\angle BCF$ and $\angle FBC$, $\angle BFO=\angle BOF=2\angle COR$. Since $\angle BOF=2\angle COR$, $\angle COR$ is one-third the $\angle ROQ$.

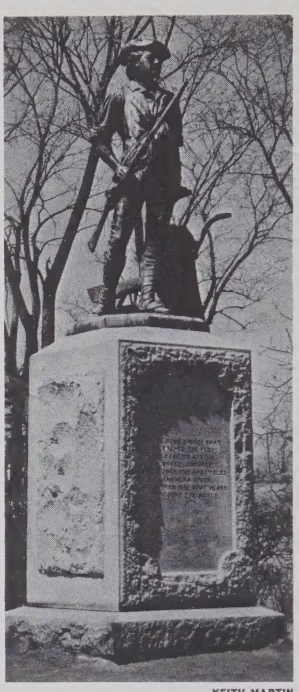
CONCHOS RIVER, in Chihuahua State, N Mexico, rises in the Sierra Madre Occidental, 90 miles WSW of Chihuahua, and flows in a northeasterly direction for about 350 miles. The Conchos joins the Rio Grande at Ojinaga, Mex., opposite Presidio, Tex. It is used primarily for irrigation. Along its middle course are Lake Toronto and some dams and hydroelectric stations.

CONCILIATION. See ARBITRATION, INDUSTRIAL; ARBITRATION, INTERNATIONAL.

CONCLAVE, a private or closed assembly, especially an ecclesiastical meeting; specifically, the meeting of the Sacred College of Cardinals for the election of a pope of the Roman Catholic church. This method of election was adopted in 1179 by the Third Lateran Council. During the balloting the cardinals are locked in the Vatican Palace to prevent communication from outside. For election a candidate must receive two-thirds, plus one, of the ballots cast. In practice the pope has been chosen from among the cardinals since the fourteenth century. See CARDINAL; PAPACY; POPE.

CONCORD, city, W California, in Contra Costa County, on the Sacramento Northern and the Southern Pacific railroads; 25 miles NE of San Francisco. Concord is the shipping center for a dairying and truck farming area. It was built on the site of Salvio Pacheco's rancho, where the adobe ranch house (1853) still stands. Pop. (1955 special census) 24,084.

CONCORD, town, E Massachusetts, Middlesex County, on the Concord River; on the Boston and Maine Railroad; 17 miles WNW of Boston. Concord is famous for its historic and literary associations. On Apr. 19, 1775, after a battle between the British and colonists at Lexington, British troops entered Concord to destroy the collection of colonial military stores (see LEXINGTON, BATTLE OF). At the North Bridge (restored), the British fought colonial Minutemen who "fired the shot heard 'round the world," beginning the Revolutionary War. Marking the site of the battle at the Concord River, is the *Minuteman* statue. Concord holds a significant place in American literature for it was the home of Louisa May and Amos Bronson Alcott, William Ellery Channing, Ralph Waldo Emerson, Nathaniel Hawthorne, and of Henry David Thoreau. In the town are the Emerson House, built by the famous poet; the Thoreau-Alcott House, where Thoreau died; the Wayside and the Orchard House, homes of Amos Bronson Alcott and his daughter Louisa May; and the School of Philosophy, where Alcott conducted Transcendentalist meetings (see TRANSCENDENTALISM). The Antiquarian House is famed for its New England antiquities. Two miles south of Concord is Walden Pond (see WALDEN POND), made famous by Thoreau. Pop. (1955 est.) 10,889.



KEITH MARTIN

The famous *Minuteman* statue at Concord commemorates the first battle of the American Revolution.

BIBLIOG.–J. L. Swayne, ed., *Story of Concord* (ed. 1939); T. Scudder, *Concord: American Town* (1947).

CONCORD, city, S central New Hampshire, capital of the state and county seat of Merrimack County, on the W bank of the Merrimack River, on the Boston and Maine Railroad, and on U.S. highways 3, 4, and 202; a scheduled airline stop; 62 miles NNW of Boston, Mass. The city was settled around 1725 as Penacook, incorporated as Rumford in 1733, and finally changed to Concord in 1765. The city was made the capital of the state in 1808. Franklin Pierce, fourteenth U.S. President, lived in Concord and is buried there. Principal industries of the city include textiles, printing, publishing, electrical products, leather processing, wood products, and granite quarrying. Pop. (1955 est.) 28,500.

CONCORD, city, S central North Carolina, county seat of Calarrus County, on the Piedmont, and on the Southern Railway and U.S. Highway 601; 18 miles NE of Charlotte. Concord is a textile manufacturing center and has woodworking and machine shops. It was founded about 1796 as a gold mining town. Pop. (1950) 16,486.

CONCORD, municipality, SE Australia, in the state of New South Wales, on the S bank of the Parramatta River; W suburb of Sydney. Pop. (1954) 28,325.

CONCORDANCE, in medieval thought, the method by which opposing or contradictory viewpoints were brought into accord. Bringing concord was also conceived as being a historical task, and concordance was regarded by some historians of the Middle Ages as a historical process, as well as a way of thinking. Concordance had to do with the resolution of paradoxes, whether in the realm of ideas or in the social order, usually in terms of the relative importance of conflicting ideas or actions.

The development of concordance as a method of thought was linked to the development in Europe, during the twelfth century, of the university, which came to be regarded as a place where opposing schools of thought were taught to the same student body at the same time in the same place. In this the university differed from the academy, where only one point of view could be taught. The universities were places of dispute, and the method of disputation was concordance. By the year 1000 the church was heir to a vast quantity of authoritative but frequently contradictory statements by the church fathers on every conceivable aspect of divine and human existence. Concordance developed first as an attempt to resolve the conflicting ideas contained in the early writings. The schoolmen assumed that while affirmation of a statement purporting to be truth could be total, negation could never be more than partial since all parties to a dispute agree on the *credo* (that which could not be doubted by reason of its overriding importance beyond logic) but they agreed to disagree on the unimportant or accidental things or the notions which could be rejected apart from the *credo*. Hence all agreed on the existence of God, but statements by human beings about supposed aspects of God were considered disputable.

Philosophy and Theology. Pierre Abélard's *Sic et Non* (Yes and No) was the first, and some have said the greatest, attempt to bring into concord conflicting assertions; in it he juxtaposed conflicting truths from the Fathers and then concorded them. At the University of Paris, the problem of universals was in dispute: the doctrine of realism dominated the local archbishop's school on the island, while the opposing doctrine of nominalism was prevalent within the international student body at the free schools on the left bank. Abélard earned the enmity of the realists by denying that all words are eternal, since only God is eternal; but he rejected nominalism by saying that an expression (*sermo*) may partake intimately of eternity by being the right and *necessary* word at the time. His concordance, then, consisted of distinguishing between unimportant words (horse, house) which are *arbitrary*, and important words (God, Trinity) which are *necessary*. Virtually all of the scholastic philosophers adopted the method of Abélard's *Sic et Non*, although some varied it a little. In each of his articles, St. Thomas Aquinas proposed a question, set forth objections to the affirmative position, replied to the objections, and came to a conclusion that may serve as the initial question (or proposition) in another article. See Abélard, Pierre; Conceptualism; Nominalism; Realism; Scholasticism.

Law and Medicine. At Bologna, the leading center of juridical studies, canon lawyers competed with civil (Roman) lawyers. One of the most important questions in dispute was that of marriage: which had primary jurisdiction, church or state? The state, which permitted cradle engagements and the marriage of cousins, said that it should have jurisdiction so as to insure continuity of property ownership, inheritance of titles, and the like. The canon lawyers denounced cradle engagements and marriage between cousins, asserted that marriage was a sacrament, and claimed full jurisdiction for the church. There were sound reasons and authorities in support of both positions. The concordance, effectively ending the dispute, was to give the church authority over personal aspects: impediments abolishing cradle engagements and other abuses were established, as was the idea of *unioprolium* (a man's children by several marriages became equal before the law). The state assumed control over civil aspects—inheritance of land, titles, and the like. Within canon law itself, Franciscus Gratianus' *Concordia discordantium canorum* was virtually the beginning of *systematic* canon law. At Salerno, base hospital for the Crusaders, Arabic medicine competed with the classic medicine inherited from the Greeks and Romans.

Modern Times. After the middle of the nineteenth century, with the development of existentialism and its concern with paradox, there was growing interest in concordance both as a method and as a process in the development of thought and action (see Existentialism). This interest is exemplified in Eugen Rosenstock-Huessy's *Heilkraft und Wahrheit: Konkordanz der Politischen und der Kosmischen Zeit* (Healing Power and Truth: Concordance of Political and Cosmical Time, 1952). F.S.

CONCORDAT, an agreement made by the temporal authority of a state with the Roman Catholic pope, in his spiritual capacity, to determine their respective powers in the regulation of the affairs of the Catholic church within the state. A concordat usually involves state recognition of an official status for the Catholic church, guarantees certain rights and privileges of the church, and provides for state participation in important ecclesiastical appointments. The Concordat of Worms, a dual proclamation made in 1122 by Pope Calixtus II and Emperor Henry V of Germany, provided the basis for the later agreements. This concordat arose out of the long struggle between the temporal authority and the spiritual authority; the chief issue involved the investiture of ecclesiastical officials with their offices. The emperor gave up the rights of appointment and of spiritual investiture but retained the right of temporal investiture; this gave him the power to prevent appointments not to his liking. See Investiture.

A famous concordat was that of 1801 made by Pius VII and Napoleon, re-establishing the Catholic church in France after the French Revolution. The government was granted the power to nominate bishops while the pope received the right of canonical installation. Parish priests were to be appointed by the bishops, but only with the approval of the government. The pope recognized the loss of church property confiscated during the Revolution, and in return the government agreed to provide support for the clergy. The concordat was abrogated by the French government in 1905 during a period of anticlericalism. Another notable concordat was the Lateran Treaty of 1929 between Pius XI and Premier Mussolini, an agreement which ended the long period of strained relations between the papacy and the Italian state, and established Vatican City as a sovereign state. (See Lateran Treaty; Vatican City.) Concordats have been made with the following countries: Colombia, 1892; Poland, 1925 (abrogated by the Polish Communist government in 1945); Rumania, 1929 (repudiated by Rumania in 1948); Germany, 1933 (still in force in West Germany); Portugal, 1940; Spain, 1953; and *modus vivendi* with Ecuador, 1937. See Roman Catholic Church.

CONCORD COLLEGE. See Colleges.

CONCORDIA, city, N central Kansas, county seat of Cloud County, on the Republican River; on the Burlington, the Missouri Pacific, the Santa Fe, and the Union Pacific railroads, and U.S. Highway 81; 110 miles WNW of Topeka. Concordia is in a farming area which produces wheat, corn, alfalfa, and livestock. The city manufactures brick and cement products, and has food and agricultural processing industries, and railroad shops. Pop. (1955 est.) 7137.

CONCORDIA, city and port, NE Argentina, in the province of Entre Ríos, in the humid pampa, on the Uruguay River; opposite Salto, Uruguay, 220 miles N of Buenos Aires. Concordia is a railroad and

trading center for a livestock raising area which produces meat, hides, fruits, and maté. It is noted for fine public gardens and parks. Pop. (1955 est.) 59,000.

CONCORDIA, town, NW Colombia, in the department of Antioquia, 29 miles SW of Medellín. Concordia is located at an elevation of nearly 7000 feet in the Cordillera Occidental of the Andes Mountains. It is a market and processing center for an agricultural district producing coffee, grain, fruits, tobacco, and cattle. Pop. (1951) 15,384.

CONCORDIA COLLEGE. See COLLEGES AND UNIVERSITIES.

CONCORDIA TEACHERS COLLEGE. See COLLEGES AND UNIVERSITIES.

CONCRETE is a building material made by mixing cement, an aggregate, and water. The cement used generally is a hydraulic cement (see CEMENT, Building Cements). The aggregate is composed of some hard inert material of coarse grading such as gravel, broken stone, or blast-furnace slag, and a finer material such as sand. Water is necessary to produce the chemical reactions that cause the mix to harden.

Concrete is plastic when first mixed but changes to a stonelike substance. It will harden under water, and this property has led to many of its uses. It probably is the leading building material in use for breakwaters, piers, foundations, dams, and other structures exposed to water. Extensive studies of concrete-making materials and practices have enabled users to produce concrete with the qualities required for almost any condition.

CHARACTERISTICS

Strength of concrete is primarily compressive strength (resistance to crushing). It depends to a considerable extent upon the water content of the original mix, as indicated by the following table:

WATER CONTENT *gallons per sack of cement*	COMPRESSIVE STRENGTH AT 28 DAYS *lbs. per sq. in.*
5	6000
6	5000
7	4200
8	3300

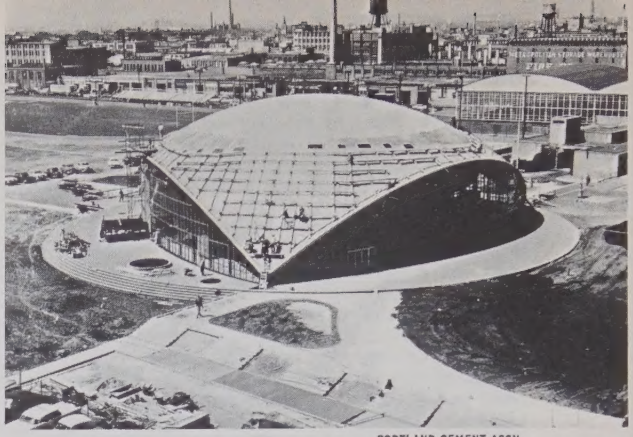
The strength of concrete also varies with other factors, among which are age, conditions of curing, and quality of materials. If concrete is kept moist its strength increases almost indefinitely, although the rate of increase is very slow after the first few weeks. Low temperatures reduce the increase, and below freezing it practically ceases. For these reasons, concrete is kept wet for at least the first week after placing and is protected against cold for some days.

Designs are usually based on safe working stresses, which are proportional to the ultimate compressive strength of the concrete. Where f'_c represents ultimate compressive strength, the following working stresses are usually permitted.

Direct bearing	.25 f'_c
Flexure	.45 f'_c
Shear	.02 to .12 f'_c (depending upon amount and location of shear reinforcement)
Bond	.04 f'_c (plain bars) .05 f'_c (deformed bars)

Durability. Concrete can be made to withstand the most severe weathering conditions. Dams and other structures have withstood 50 years and more of alternate wetting and drying, freezing and thawing. On the other hand, structures that are improperly built may deteriorate in a short time. For severe conditions it is essential to provide a dense concrete and good coverage over all-steel reinforcement. Most acids and some vegetable oils attack concrete, so protection must also be provided against these. The most destructive force is the freezing of water trapped inside concrete. This is often counteracted by using concrete containing 3 to 6 per cent air in the form of tiny bubbles produced by air-entraining agents. The bubbles act as little reservoirs to permit contained water to expand when freezing.

Fire Resistance of concrete is good because its heat conductivity is low. Except in the most severe fires the only damage to concrete usually is surface chipping, which is easily repaired. Concrete is often applied to structural-steel building members in coats 1 to 3 inches thick to fireproof the steel. See FIRE PREVENTION AND PROTECTION, Fire Protection, *Fire-Resistive Construction.*



PORTLAND CEMENT ASSN.

This auditorium, shown under construction, has a thin-shell concrete dome. The dome, securely anchored at three points, was cut away to accommodate the glass side walls.

PRODUCTION

Proportions of the ingredients in concrete mixes formerly were specified by arbitrary formulas giving the volumes of fine and coarse aggregates to be used with each volume of cement. Later it was found that strength, watertightness, durability, and other qualities of concrete were related to the amount of mixing water, improving with reductions in water so long as the mixes were kept workable enough to allow proper placing. It then became the custom to specify the maximum amount of mixing water permitted for all concrete exposed to the elements. Minimum strengths may also be specified and may be the only requirement for concrete that is not exposed; the contractor uses the amounts of mixing water that will produce the specified strengths. Maximum water contents for exposed work depend on conditions of exposure and type of structure. In concrete that must be watertight, the total mixing water usually does not exceed six gallons per sack of cement. The amount of fine aggregate usually is not less than half of nor more than equal to the amount of coarse aggregate. Proportions vary with type of work, size, and grading

These men are using a stationary power mixer, employed for construction where only small quantities of concrete are necessary or the use of truck-borne mixers is not feasible.

CHAIN BELT CO.

of aggregates, and other factors. In general, the proportions must be such as to produce a workable mixture that can be placed without segregation of the materials.

Mixing is nearly always done in power mixers, and practically all specifications prohibit hand mixing except for very small quantities. Most mixers are of the batch type, consisting of a drum in which the dry materials and water are mixed by rotation. The drum is filled and dumped for each batch. Many mixers are mounted on trucks so that the concrete can be mixed while it is being transported to the point of use.

Forms are confining molds made to the size and shape desired for the hardened concrete. Their proper design and construction are important features of concrete work. Forms are often made of lumber or plywood sheets closely joined and backed against studs and struts that are braced together to resist the weight and hydraulic pressure of the wet concrete. Steel is also used for forms, especially where the forms must be re-used many times.

Finish. Workmen often finish exposed building surfaces by brushing on a cement grout, much of which they then scrape off with a trowel. They rub the loose remainder off with burlap after it has dried, leaving a uniformly colored surface with pits and holes filled. Other finishes are produced by rubbing concrete to a smooth surface with an abrasive stone, by tooling the surface to give the effect of dressed stone, and by exposing the aggregate. Aggregates can be exposed by removing the forms and brushing the partially hardened concrete with wire brushes, by washing it with acid, or by casting the concrete in forms surfaced with a material that prevents the cement in contact with it from setting. Concrete is also painted with cement or oil paints. Floors are usually finished by troweling to a smooth surface, and roadways are given a rougher finish.

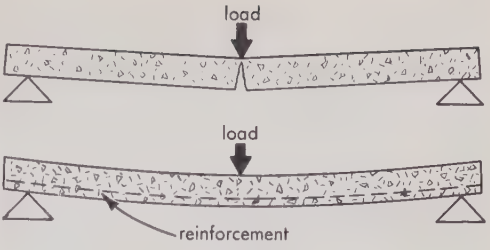
Ornamentation. Plaster molds for ornamental details difficult to produce in wood or steel are often inserted in the forms used for producing architectural concrete. The plaster is broken off when the concrete has hardened. Other common ornamental concrete items are mantelpieces, garden ornaments, and statues.

Waterproofing. Well-made dense concrete is watertight. Poorly made concrete may leak, however, especially through construction joints and at porous areas resulting from use of lean mixtures improperly placed. Finely divided powders such as hydrated lime are sometimes used to improve watertightness. They achieve their effect by improving workability of the mix. Concrete can also be waterproofed by applying exterior coatings, usually of bituminous materials. Membranes are sometimes built up by embedding cotton fabric in the bitumens.

Classification

Mass Concrete is usually plain concrete in large masses, although reinforcement is used in some cases to take up shrinkage and temperature stresses. When reinforcement is used, however, it does not carry any of the applied loads. Mass concrete is cast in the location where it is to be left, such as large gravity dams (see Dam). Foundations, heavy retaining walls, and piers are other examples.

Reinforced Concrete has steel embedded in it. Concrete itself is notably high in compression strength (resistance to crushing), but low in tensile strength (resistance to pulling). Steel has high tensile strength, and imparts this quality to reinforced concrete. In columns, reinforcement helps the concrete carry compressive stresses in addition to resisting tensile stresses due to bending. The steel used is generally in the form of rods with projections that improve the bond with the concrete. Woven, welded, and expanded mesh are also used. The accompanying drawing illustrates reinforced and unreinforced beams and shows how each reacts under a load.

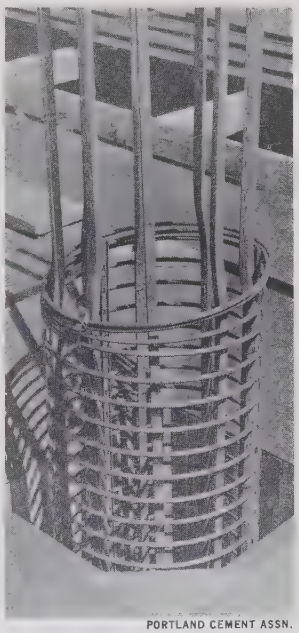


Concrete Beams, With and Without Reinforcement

Many buildings have frames consisting of reinforced concrete columns, beams, and floor slabs. Exterior walls are suspended on the frame and may be of concrete, masonry, metal, glass, or combinations of these materials. Exterior concrete wall elements in which decorative features are cast are called "architectural concrete." They first became popular in locations subject to earthquakes because of their rigidity and because there is nothing in them to shake loose. Their use has spread widely. Bridges, trestles, grade separations, water tanks, pavement, grain elevators, sewage-disposal plants, pumping and filtration plants, and dams are other applications of reinforced concrete.

An important recent development is shell construction, in which surface loads are sustained by thin curved slabs. Its principal use is in long-span roofs where large areas of unobstructed floor space are required, as in aircraft hangars and auditoriums. No supporting columns are needed because the curved slabs, which are usually but 3 to 3½ inches thick, are strong enough to carry enormous loads.

Prestressed Concrete is a type of reinforced concrete in which tensile stress in the reinforcement and compressive stress in the concrete are introduced into the members at the time of construction. When the reinforcing steel is stretched before the concrete is placed, the member is said to be *pretensioned.* In a beam like that in the accompanying drawing, for example, the reinforcement is held firmly at one end and stretched by pulling the other end. The tension thus produced in the steel is held until the concrete has been placed and has hardened and bonded to the steel. The pull is then released and the steel tends to shorten. This places the concrete in the bottom of the beam in compression. When the load is applied on top and the beam bends downward, the compressive forces in the bottom are reduced. The design is usually such that only a part of the precompression is canceled when the designed load is applied, so the concrete undergoes little if any tensile stress.



PORTLAND CEMENT ASSN.

Steel reinforcing rods of this type are employed to give concrete columns a high tensile strength.

In large prestressed girders the steel is usually in the form of wire cables strung through holes formed in the concrete or placed in tubes so that they do not

bond to the concrete. The cables are stretched after the concrete has hardened, so this technique is called *post-tensioning*. It is also used for prestressing circular concrete tanks; the walls are cast and wire is stretched around them after the concrete has hardened.

Both types of prestressed concrete permit use of smaller members for a given load, larger loads for a given size member, or longer spans between supports. The first large prestressed concrete structure built in the United States was the Walnut Lane Bridge in Philadelphia, completed in 1951. Since then, use of the material has increased rapidly for buildings, tanks, pipes, poles, piles, and bridges. See BRIDGE, *Bridge Members*.

Precast Concrete articles are cast and used as units. They include masonry units for building construction, floor joists and slabs, bridge slabs, bearing piles and sheet piles, burial vaults, septic tanks, sewer and drain pipe, cast stone for building facing, lighting standards, and garden benches.

Precast masonry units are often called concrete blocks. The most common size is 8x8x16 inches, and they usually contain one or more vertical openings. They are laid in cement mortar for walls and also as backup for other masonry such as brick and stone. The blocks are made on power machines that place a fairly dry mix in a mold of proper size and shape and compact it by tamping, jogging, and vibration. The block and a pallet on which it rests are then removed to a curing room in which the concrete is kept moist and warm for several days. Curing is sometimes accelerated by a steam bath. Precast piles up to 24 inches square and over 100 feet long have been used for bridges and other structures. Some railroads use precast piles of even larger cross section for trestle construction.

In tilt-up construction, the foundations and floor are first laid and then concrete wall panels are cast in a horizontal position on the floor. When these have hardened they are tilted up into the wall and the narrow space between them is filled with concrete. The amount of form work is greatly reduced by this system, and it is easier to place the reinforcement and concrete.

Lightweight Concrete. Concrete made with natural sands, gravels, and crushed stones generally weighs from 145 to 150 pounds a cubic foot. There are many applications where lighter concrete is advantageous, and several methods have been developed for making it. The method most often employed in the United States is use of lightweight aggregates. These include slag, cinders, pumice, and shales, clays, and vermiculite that have been expanded by furnace processing. In Europe, foaming or expanding agents are frequently added to concrete mixtures to produce aerated products weighing as little as 25 pounds a cubic foot. Some of the very light concretes are used only for insulation rather than for structural purposes because their strength is low. See BRIDGE; CEMENT, Building Cements; DAM; FOUNDATION; MASONRY; ROADS AND HIGHWAYS. O. A. N.

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CONCRETION, masses of rounded or irregular form which occur in sedimentary rocks, and particularly in sandstones, shales, clays, and impure limestones. Concretions vary greatly in size, ranging from microscopic particles to masses 10 feet or more in diameter. Some concretions were formed during sedimentation; others developed after the deposit was laid down. Both types resulted from the aggregation of certain chemical substances around nuclei, such as fragments of bone, leaves, wood, or shells. Concretions usually differ in composition from the rock in which they occur. Some are siliceous, others are pyrite, chert, or calcite. Concretions which contain cracks filled with different material, often calcite or pyrite, are called septaria. In limestones and dolomites, rounded mineral aggregates resembling fish eggs are often found. These concretions are called oölites. See OÖLITE.

CONCUBINAGE, an ancient form of marriage which, although recognized and regulated by law, did not carry with it the legal rights of property and succession which are characteristic of civil marriage. In the Near East and the Orient, concubinage is simply the relationship of secondary or subordinate marriages held concurrently with a fully recognized or primary marriage. In the United States generally, concubinage is not a marriage but only cohabitation, excepting in Louisiana where "quiet concubinage" is recognized and a concubine may inherit up to one-tenth of her master's movable property.

In ancient Greece and Rome concubinage was common and respected. In Greece it was the form of marriage with a foreigner, or freed or dowerless woman, whereas the marriage proper was with a freeborn woman with dowry. In Rome concubinage was the form of marriage between patrician and plebeian or between plebeians.

Concubinage marks a stage in the development of the institution of marriage toward definite and consistent monogamy. Recognized by law, it was, nevertheless, of inferior sanctity as compared with regular marriage, although the laws of adultery also applied to it. However, when the regular marriage yielded no heir, concubinage was not only permissible but laudable under the patriarchal or family religion of classical times.

The institution existed in Old Testament times, but it had its widest extension in Rome. Its practice became so great that Augustus, to check licentiousness and to promote stability in the marriage relation, forbade or at least materially restricted it by legally degrading the position of a concubine by the *Lex Julia*. The practice continued, however, and concubinage as a legal institution was not abolished in Germany, for instance, until 1577. Handfasting and many other forms of irregular marriage were in effect types of concubinage. See MORGANATIC MARRIAGE.

CONCUSSION. See HEAD INJURY, *Brain Concussion*.

CONDÉ, HENRI II DE BOURBON, PRINCE DE, 1588–1646, French political figure, was born at St.-Jean-d'Angély. Although a scion of the Huguenot house of Bourbon, he was reared a Roman Catholic. After being imprisoned, 1616–19, for intrigue against the crown, he became an adherent of Cardinal Richelieu and fought Protestantism.

CONDÉ, LOUIS I DE BOURBON, PRINCE DE, 1530–69, French general, was born at Vendôme. The younger brother of Antoine de Bourbon, King of Navarre, Louis was the first Prince de Condé. As military and political chief of the Huguenots, he led the conspiracy of Amboise, 1560, an attempt to force Francis II to recognize Protestantism. Saved from execution by the sudden death of the king, Louis was later pardoned by Catherine de Médicis, who appointed him governor of Picardy. But after the massacre of the Huguenots at Vassy, 1562, by the Duc de Guise, Louis again took up arms in behalf of the Protestants. He was killed at the battle of Jarnac.

CONDÉ, LOUIS II DE BOURBON, PRINCE DE, called the Great Condé, 1621–86, French general, was born in Paris. He bore the title Duc d'Enghien during his father's lifetime. Compelled by his ambitious father, Henry II, Prince de Condé, to marry Cardinal Richelieu's niece, d'Enghien's influence was further strengthened by his military victories over the Spaniards at Rocroi, 1643, over Mercy at Nördlingen, 1645, and at Dunkirk in 1646, when his power was so great as to constitute a threat to the realm. He supported the crown against the

Fronde until his arrogant attitude toward Cardinal Mazarin and the regent, Anne of Austria, led to his imprisonment, 1650–51 (see MAZARIN, JULES; FRANCE, History; FRONDE). Upon his release, Condé fled France and joined the Spaniards, fighting with them against the French until his defeat at Dunkirk in 1658. When Spain negotiated the peace treaty of the Pyrénées in 1659, Condé obtained a pardon from Louis XIV and was restored to his former rank as a general in the French army. He retired to Chantilly in 1675.

CONDÉ, LOUIS JOSEPH DE BOURBON, PRINCE DE, 1736–1818, French soldier, great grandson of Louis II, Prince De Condé, was born in Paris. He commanded the "army of Condé" against the revolutionists and afterward retired to England in 1800. He returned to France at the time of the Bourbon restoration.

CONDEMNATION PROCEEDING is the form of legal redress whereby a government may enforce its right of eminent domain, the taking of private property for public use. A government has this right by virtue of its sovereignty and independently of any constitutional provision delegating this power to it. The federal and state constitutions protect private landowners, however, by providing that just compensation be paid for damage to private property by the state.

A government has the right to delegate its power of condemnation to its agencies and to municipal and private corporations of a quasi-public nature, such as railroads and public utility companies. Under the customary tripartite division of governmental power it is the legislative department that is invested with the condemnation power.

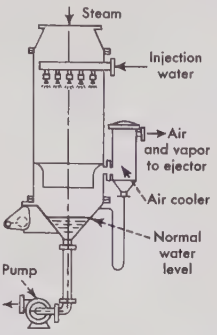
CONDENSATION, a physical process in which a substance changes from a gaseous or vaporous state to a liquid or solid state. It is the inverse of vaporization, a process that includes evaporation from the surface of a liquid and also boiling (see EVAPORATION; BOILING POINT). Water vapor in the atmosphere condenses to form dew or clouds, and on humid summer days atmospheric moisture condenses on cold objects such as cold water pipes or pitchers containing iced lemonade. (See DEW; CLOUD, *How Clouds Are Formed.*) Pure, soft water is obtained in the laboratory by distillation, a process in which the water is first turned to steam by boiling and is then condensed to liquid state again (see DISTILLATION). The heat in the radiators of a steam-heating system is chiefly that given up as steam condenses to water. Thus, condensation is a heat-emitting process. At a given temperature and pressure, one gram of a substance gives up exactly the same amount of heat in condensing as the amount that must be supplied to vaporize it. Some substances pass directly from the solid to the gaseous state, or condense from the gaseous to the solid state, without becoming liquid. Examples of this sublimation process are the condensation of zinc oxide vapor to zinc oxide powder, of iodine vapor to iodine crystals, and of water vapor to frost. See FROST.

CONDENSED MILK. See BORDEN, GAIL; MILK; DAIRY INDUSTRY.

CONDENSER, a heat exchanger that transfers heat from a vapor to a cooling medium, thereby causing the vapor to liquefy. There are two general types—direct-contact condensers and surface condensers. In the former, the cooling medium mixes directly with the vapor and the resulting condensate; in the latter, the cooling medium is kept separated from the vapor and the condensate. The cooling medium usually is water, but may also be air or some other fluid. See CONDENSATION.

The principal uses of the condensers are (1) for condensing steam in power plants to create a partial vacuum into which engines or turbines exhaust used steam, thus providing a greater range of expansion (see STEAM ENGINE; TURBINES, STEAM); (2) for condensing refrigerant vapor to form a volatile liquid that will absorb heat from the material to be cooled (see REFRIGERATION); (3) for recovering as liquids various materials that exist in a vapor phase during some stage of a manufacturing process (see CHEMICAL ENGINEERING; DISTILLATION; DISTILLING INDUSTRY).

Direct-Contact Condensers. Jet condensers receive the vapor to be condensed at or near the top of the condenser. Water enters through jets near the vapor inlet, and the vapor condenses as it passes through the spray of falling water. The resulting mixture of condensed vapor, cooling water, and air may be removed by a single pump, or a separate pump may be used to remove the air.



Jet Condenser

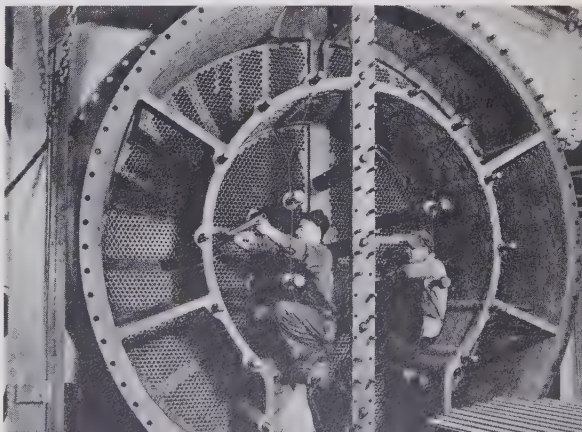
Barometric condensers also have a condensing chamber into which cooling water is pumped in jets or streams. A vacuum is maintained in this chamber by the weight of a column of water in a pipe leading downward from the chamber. This pipe must be at least 34 feet long, because atmospheric pressure supports a column of water about 34 feet high (see BAROMETER). The bottom of the pipe opens into a well from which excess water overflows. Noncondensable gases are generally drawn out of the condensing chamber by an air pump.

Ejector condensers depend upon the momentum of the vapor, as it enters the condenser through a series of openings, to sweep a stream of cooling water along with it. Their action resembles that of jet blowers (see BLOWER, *Jet Blowers*). The vapor mixes with the water and is condensed by it, and the resulting mixture discharges from the condenser. Direct-contact condensers often are built integrally with steam engines and condense the exhaust steam.

Surface Condensers are generally more expensive than direct-contact condensers and use more cooling fluid. They are preferred in some applications, however, and when the vapor being condensed must be kept separate from the cooling medium (as in refrigeration systems) they are the only type that can be used. The simple stills used in chemical laboratories have surface condensers.

Water-cooled condensers usually consist of a vapor-filled outer shell containing a system of tubes through which cooling water circulates. The arrangement somewhat resembles a water-tube boiler. When the vapor enters at the top of the shell and the coolant enters through the lower tubes and circulates upward, as is generally the case, the unit is called a counterflow condenser. When both vapor and coolant enter

Because only a combination of fresh and marine water is available for cooling, the 6250 18-foot tubes in this condenser are made of a special arsenical aluminum brass.
AMERICAN BRASS CO.



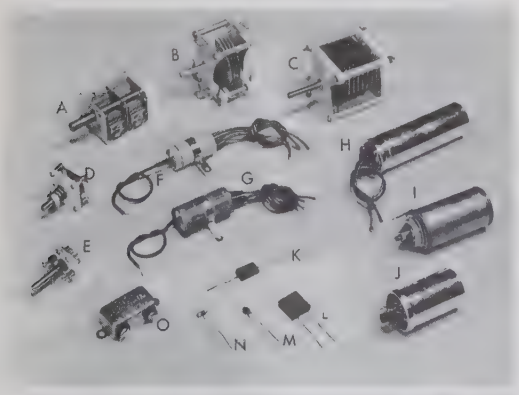
at the top, the unit is called a parallel-flow condenser. Pumps circulate the coolant through the tubes and remove condensate and noncondensable gases from the shell. Water-cooled condensers are used in industrial distillation systems. They also condense steam from steam turbines.

Air-cooled condensers remove heat from vapor by passing cool air through a system of tubes in which the vapor circulates. The system often has ribs or fins to increase its surface area, making it resemble an automobile radiator. Fans usually are provided to keep air moving through the system. This type is often used in home refrigerators.

Evaporative condensers depend on both air and water to cool the vapor. Water flows or is sprayed over tubes carrying the hot vapor, and absorbs heat from the tubes. This heat is then carried away by a stream of air blown over the surface of the water. Part of the water evaporates; the rest is often cooled further and re-used. These condensers are often found in commercial refrigeration systems.

CONDENSER, also called capacitor, is a device for storing positive and negative electric charges on a pair of conductors. A conductor of electricity, that is, a sheet or plate of a conducting metal, placed parallel with and close to an identical conductor, will function as a condenser. If one conductor, generally called a plate, receives a positive electrical charge (see Fig. 1), the other plate will develop a negative charge of equal magnitude. An electric field exists between the two charged plates and associated with this field is a difference of electrical potential, or voltage. Thus a condenser is capable of storing electrical energy and has the ability to do work.

The capacitance of a condenser is a measure of the ratio of the stored charge Q to the accompanying potential difference V, namely, $C = Q/V$. If the charge on one of the plates increases, the accompanying potential difference will proportionally increase, and the capacitance will remain the same, or nearly so, for a given condenser. This ratio is a characteristic property for a given condenser. The unit for measuring capacitance is the farad, analogous to the quart as a measure of liquid. A condenser would have a capacitance of one farad when the charge on a plate is one coulomb at a potential of one volt (see COULOMB; VOLT). The farad, named in honor of Michael Faraday, is so large that in practice its millionth part, the microfarad, is commonly used. For example, when a condenser of 5 microfarads capacitance is connected across a 6-volt battery, charges of plus and minus .00003 coulomb, respectively, accumulate upon its two plates. If the condenser is then disconnected from the battery the charges are stored indefinitely, except



ALLIED RADIO CORP.

Shown above are: *A, B, C, D,* and *E,* Variable capacitors; *F,* Quadruple section tubular electrolytic; *G,* Tubular electrolytic; *H* and *I,* Transmitting capacitors; *J,* Plug-in electrolytic; *K,* Midget mica capacitor; *L,* Encapsulated molded midget micas; *M,* Ceramic capacitor; *N,* Temperature compensating capacitor; *O,* Metal shell paper capacitor.

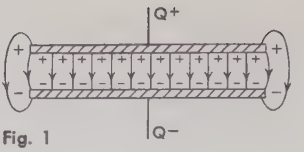


Fig. 1

for the slow leakage that results from imperfect insulation. If at any later time the plates are connected through a wire or resistor, the stored charge of .00003 coulomb flows from the positive to the negative plate through the wire, the potential difference falls to zero and the condenser is said to be discharged.

Dielectric. The capacitance of a particular condenser is dependent upon any insulating material that fills the space between the plates. This material is called the dielectric (see DIELECTRIC) and acts to reduce the electric field and the corresponding potential difference. Since the capacitance of a condenser is a ratio of the charge on a plate to the potential difference, a decrease in potential, through the introduction of a dielectric, will increase the capacitance. The amount by which a particular dielectric material will increase the capacitance of a condenser as compared to a vacuum is a constant ratio for any insulating material. This ratio is called the dielectric constant. If it is a solid, the dielectric may also perform the mechanical function of separating the plates or providing structural strength. All dielectrics have finite conductivity and many exhibit a phenomenon called dielectric absorption. In both cases an undesirable loss in electrical energy results, especially at high frequencies. Dielectrics will also break down under excessively high voltage and, consequently, limit the maximum voltage that can be applied to a condenser.

Types of Condensers. Condensers are manufactured in different shapes and of various materials. They may range in size from the very small printed circuit condensers to the very large industrial types. Paper condensers are made of foil separated by a dielectric of insulating paper and are rolled up for compactness. They are inexpensive and are used for moderately large values of capacitance. Mica condensers are higher in quality than paper ones and have a higher breakdown voltage. Electrolytic condensers have a thin dielectric layer formed by electrolysis of one or both electrodes, which is usually aluminum oxide on aluminum (see ELECTROLYSIS). These condensers achieve large capacitance at moderate cost and in small space, but are restricted in voltage rating. At high voltage, oil-filled condensers are often used. Variable condensers, for which the capacitance can be changed, are used as tuning elements in radio circuits.

Each particular type of condenser is available in a wide capacitance range and rated voltage. In general, the capacitance of a condenser can be increased by introducing a dielectric with a higher constant, increasing the area of the plates, and decreasing the distance between the plates. Conversely, the capacitance can be decreased with a smaller dielectric constant, smaller area, and greater plate distance. For an area A of parallel plane plates, separated by a distance d and filled with material of specific dielectric constant k, the capacitance is $C = \epsilon_0 kA/d$. In this formula, the universal constant ϵ_0 is 8.85×10^{-12} farads/meter, so that C is measured in farads if A is measured in square meters and d in meters.

Combinations of Condensers. The range of condensers can also be increased in an electrical circuit by combining them in parallel or in series. When condensers C_1 and C_2 are connected in parallel, as shown in Fig. 2a, the total charge stored is the sum of the charges of the two condensers, while the potential difference across the pair is the same as that between the terminals and across the individual condensers. From the basic relationship, $Q = CV$, it follows that the parallel combination has a total capacitance

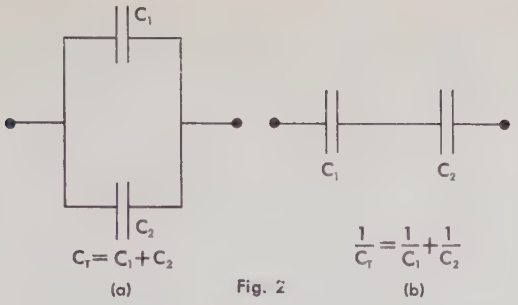


Fig. 2

equal to the sum of each individual capacitance, or $C_T = C_1 + C_2$. In series connection (see Fig 2b), each condenser receives an equal charge, while the potential difference between the terminals is the sum of the potential difference across the individual condensers. Therefore the equivalent capacitance C of the series combination is the reciprocal sum of the individual capacitances, given by the relation $1/C_T = 1/C_1 + 1/C_2$.

Energy Storage takes place in a charged condenser. The energy may be considered to result from the work required to separate the positive and negative charges on the two plates of different potential. The energy is stored in the electric field. During charge and discharge of a quantity Q of electric charge, the average potential difference across the condenser is half the value V at full charge, and the energy, which is equivalent to work W, is $W = \frac{1}{2}QV$. W is in joules if Q is in coulombs and V in volts (see JOULE).

Time Constant. When two plates of a condenser are connected to a battery there is a sudden surge of current to charge the condenser; but since a potential increase is associated with an increase in charge, an opposing voltage will develop that will have a tendency to send the electrons back to the battery. When this potential is equal (it can never be greater) to the potential of the battery, the current will fall to zero and the condenser will be fully charged. The relation between the condenser's charge, charging current,

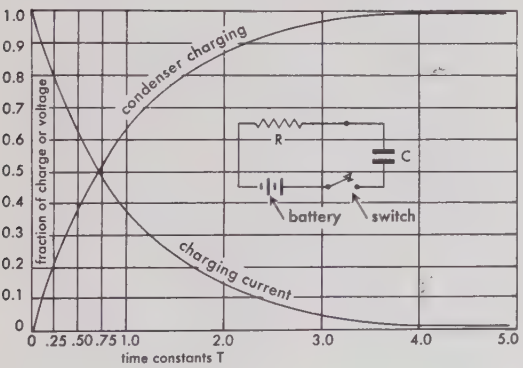


Fig. 3

and time is shown in Fig. 3. Note that both curves have the same slope but opposite directions. (See ANALYTIC GEOMETRY.) These types of curves are called exponential curves. (See EXPONENT, *Exponential Functions.*) The time required for a condenser to reach 63.2 per cent of its full charge is the time constant and it is dependent upon the capacitance of the condenser and the resistance in the circuit. The time constant T is given by the formula $T = RC$, T being in seconds when the resistance R is in ohms and the capacitance C is in farads. Thus if the resistance through which the condenser charges or discharges is increased, the time required to complete either operation will also be increased. Condenser-resistor combinations are often used in electrical circuits to produce a time delay. Multivibrators and saw-tooth generators in radar and television are typical examples of combining the condenser with a resistor. See CONDUCTION; ELECTRONICS.

Oscillatory Discharge of a condenser may occur when the charged condenser is connected to a coil of wire. Figure 4 shows the general character of such a discharge. The charge Q overshoots zero and oscillates in such a way that the time interval between successive peaks is a constant, called the period (see PERIOD AND PERIODICITY), while the amplitude of oscillation falls exponentially. In exactly the same way, a weight hanging from a spring, if drawn up and released, generally overshoots the equilibrium posi-

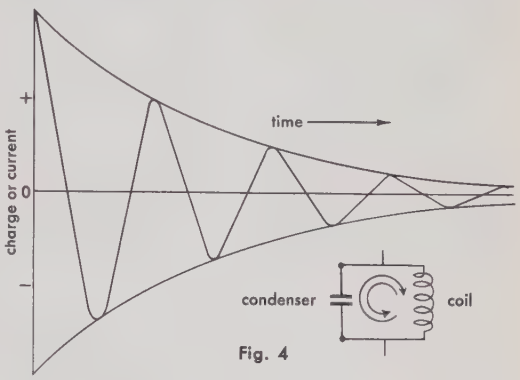


Fig. 4

tion and oscillates. The oscillations of the spring will eventually die away as a result of mechanical damping forces (see DAMPING). In the electrical system the oscillations result from the self-inductance of the coil (see INDUCTANCE; SELF-INDUCTION), analogous to the weight hanging from the spring. These electrical oscillations also decrease in amplitude owing to losses in electromagnetic radiation and electrical resistance. A condenser-and-coil circuit, excited intermittently by a spark gap, was used in the early days of wireless communication to produce high-frequency alternating current. In combination with electron tubes, the circuit can be made to oscillate continuously. See ELECTRONICS.

Alternating current seems to flow through a condenser even though, in the absence of leakage, no electrons pass through the dielectric. (See Fig. 5.) As long as the current flows in the direction labeled +, positive charges are being transferred onto plate 1 of the condenser, which creates negative charges on plate 2. When the current reverses, in a negative direction, the positive charges are transferred from plate 1 to plate 2. Thus a lamp bulb in series with the condenser lights up just as though there were a complete conducting path. One of the important applications of condensers is to block the passage of direct current while permitting alternating current to flow. See ALTERNATING CURRENT; DIRECT CURRENT.

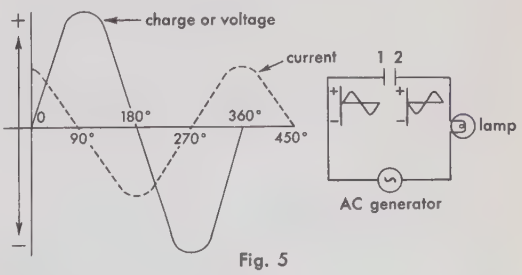


Fig. 5

As seen from the broken line in Fig. 5 the maximum current and maximum charge do not come together, but are separated by a quarter of a cycle. As the condenser is being charged it will develop an opposition

to further current flow. In other words, because like charges repel each other there is more opposition to the transfer of negative electrons to a plate already highly charged with negative electrons. Therefore when the voltage has its maximum value the current will be zero and out of phase with the voltage by a quarter of a cycle, or 90°. Because of this property, condensers are often used with induction motors, which have a winding that uses the out-of-phase current for starting. In combination with the opposite phase shift produced by the self-inductance of coils, this property of condensers permits resonance, or tuning, of a circuit to a desired frequency, as in a radio receiver. See Electric Circuit; Electrodynamics; Electrostatics; Radio; Electronics. E. R. Peck

CONDENSER LENS, a lens or system of lenses for collecting a maximum amount of light from a source to give intense and uniform illumination on an area or an object. In slide and motion picture projectors the condenser must also direct the light rays through the object toward the projection lens. In microscopes, especially those with high-power objectives, the light is first concentrated on the object on the stage and is then directed so as to fill, or nearly fill, the objective. Careful and sometimes intricate design is necessary to eliminate optical aberrations from the condenser lens (see Aberration, Optical). Condensers are used also in searchlights to produce concentrated illumination at a distance.

CONDILLAC, ÉTIENNE BONNOT DE, 1715–80, French philosopher and psychologist, was born at Grenoble. *Essai sur l'origine des connaissances humaines* (1746) outlines his system and establishes him as a disciple of John Locke. His own system is developed in *Traité des sensations* (1754), his most important work. In *Traité des animaux* (1755), he postulates sensation as the only source of knowledge, and to it traces the origin of all intellectual processes. Among his other works are *Logique* (1780), and an important work on political economy, *Le commerce et le gouvernement considérés relativement l'un à l'autre* (1776).

CONDIMENT. See Flavoring; Herb; Spice.

CONDITION is a clause inserted in a deed for the benefit of a grantor giving him the power on default of performance to destroy the estate if he will and revest the estate in himself and his heirs. A condition not only depends on the option of the grantor, but is controlled by equity in any case where the grantor attempts to make an inequitable use of it. Condition is created by mutual agreement of parties, and is binding upon both. It may be express or implied, precedent or subsequent. It is precedent if the estate depends upon the occurrence or nonoccurrence of the contingency. It is subsequent if the estate is to be defeated upon the occurrence or nonoccurrence of the contingency. The law inclines to construe conditions as subsequent rather than precedent, and to be remedied by damages rather than by forfeiture. *Condition* is frequently synonymous with qualification or restriction, and at times interchangeable with warranty, as in insurance cases. It occurs in conjunction with estates, as where a grantor conveys the fee (absolute title), reserving a certain rent on condition that, if it is not paid, he or his heirs may re-enter the estate. No precise form of words is necessary in order to create a condition; it may be inferred from the context as in the case of condition attached to a testamentary disposition (will). See Real Property; Contingent; Executory.

CONDITIONAL SALE. See Bill of Sale; Chattel Mortgage; Sale.

CONDITIONED RESPONSE is an acquired or learned response to stimuli. A reflex is the simplest unit of neuromuscular behavior and a conditioned reflex is one that has been learned. Few reflexes, however, operate singly in an animal, and behavior presents itself as a chain of integrated reflexes or responses. A conditioned response therefore, is an *acquired chain of reflexes* and includes habits and drives developed as a result of training or learning. Psychologists usually reserve the term reflex to designate simple, separate reactions which are present at birth and persist more or less unchanged through life, such as sneezing or blinking. See Nervous System.

Pavlov's Discovery. The principle of conditioned reflex was formulated by I. P. Pavlov (1849–1936), a Russian physiologist who is considered the father of objective psychology. His discovery came almost accidentally while he was conducting experiments on the glands of digestive secretion. At that time he made the famous experiment in which he observed that a dog learned to salivate at the ringing of a bell which had been rung repeatedly while the dog was being fed. Pavlov called this *conditioning*, or learning, because the dog responded to the bell alone in exactly the same way as he had previously responded to food.

Congenital and Acquired Reflexes. Pavlov divided all reflexes into two groups: (1) those common to the species and appearing at birth or soon thereafter; (2) those acquired by the animal during its lifetime. The congenital reflexes, that is, those present at birth, Pavlov named *unconditioned*, and those acquired he called *conditioned*. His aim was to discover the facts and principles by which conditioned responses develop from the unconditioned reflexes of animals.

The Law of Conditioned Response. The flow of nervous impulses is directed to the point of greatest irritability already present in the brain. In other words, impulses reaching the cortex of the brain naturally become attracted to areas being stimulated at the time. Thus, indifferent stimuli (those originally incapable of producing a given response) become substituted for biologically adequate stimuli (those already capable of producing a given response). As Pavlov said: "The fundamental mechanism of development of a conditioned reflex depends upon excitation of some definite point in the cortex coincidentally with a more intense excitation of some other point, probably also of the cortex, which leads to a connection between these two points."

Examples of Experimental Conditioning. It is well established that there are conditioned reflexes to drugs such as caffeine, the bromides, alcohol, strychnine, and apomorphine. Conditioned responses have been obtained in human infants less than a year old. In adults successful conditioning has been obtained in finger flexion by J. B. Watson and by I. A. Hamel, and in the responses of the pupil of the eye and the eye wink by H. Cason. Watson's experiments on conditioning and reconditioning of children are excellent illustrations of conditioned response in the field of emotion.

Methods of Conditioning. Studies of conditioning, based on the Pavlov experiments with dogs, have shown that the substitute or conditioned stimulus (such as the ringing of a bell) must be presented before or simultaneously with the original unconditioned stimulus (fresh meat) in order to produce a conditioned response. If the substitute stimulus is presented *after* the original stimulus, no conditioning can be obtained.

Four successful methods of conditioning have been found. In the first of these, the substitute stimulus (ringing of bell) is introduced and permitted to influence the subject for some time. Immediately after this stimulus is discontinued (ringing stops), the original unconditioned stimulus (fresh meat), is introduced. Repetition results in a conditioned reflex, that is the substitute stimulus, the ringing of the bell, will produce salivation whether or not it is followed by meat. This has been called the *continuous* method of conditioning. In the second successful method, the substitute (bell) and the original (meat) stimuli are presented simultaneously. After a sufficient number of repetitions, a successful conditioned reflex is obtained: the animal's mouth waters when the bell rings. This method has been called *simultaneous*. In the third successful method, the substitute stimulus (bell) is intro-

duced first and kept active for a given period of time, say five minutes, and then, while the substitute stimulus is still in operation (the bell keeps ringing), the original stimulus (meat) is brought on, and the two stimuli are allowed to operate together for a given time, say 10 minutes. Repetition again results in a conditioned reflex and the animal salivates at the ringing of the bell. With this method, however, the salivation appears only after a *delay* corresponding to the amount of time the substitute stimulus was applied before the original stimulus was introduced. In other words, the animal's mouth does not begin to water until the bell has rung for five minutes. This method of conditioning has been called *delayed*. The importance of this method is that it adds a new element—time—to learning. It explains how, unwittingly, but still according to the laws of conditioning, animals, both human and nonhuman, learn to procrastinate in their responses to particular situations. In the fourth successful method, the substitute stimulus (bell) again is introduced first and applied for a given time, say five minutes, but it is then discontinued without substitution for a given time, say 10 minutes, after which the original stimulus (meat) is introduced. The result is a conditioned reflex that is delayed for a period of time corresponding *not* to the period that the bell was rung (as in the delayed method of procedure), but to the intervening inactive period that elapsed between the application of the substitute stimulus (bell) and the original stimulus (meat). The animal's mouth doesn't start watering until 10 minutes after the bell has stopped ringing. Pavlov called this the *trace* method of conditioning because there is an interval or time-lag between the two stimuli. Pavlov's theory was that when the unconditioned stimulus (meat) appeared, there was still a trace of the first stimulus (ringing of bell) left in the subject's brain, hence a conditioning could be accomplished. There is a limit, of course, to the time this trace will persist in different animals. It is undoubtedly longer in human beings, but in the dog the maximum is 30 minutes.

Summation of Conditioned Responses. When two independent conditioned responses are established, using different sense receptors (for example, a ringing bell and a stroking of the skin), the volume of the response (or amount of salivation) to the simultaneous application of both conditioned stimuli will be more powerful than either stimulus could produce alone. Often the end-product of such stimulation is the combined effect of both (as measured in drops of saliva, for example). If, however, the same sense organs are used in two conditionings by means of different conditioned stimuli (the ringing of a bell and the beating of a drum), the result is not always quantitatively measurable; it may be merely an increase in quality (intensity or rapidity) of the conditioned response. These phenomena are known as *summation*.

Generalized Conditioning. When a conditioning occurs, it is always specific. A sound of a certain order of intensity (in terms of decibels), or a light of a certain intensity (in terms of wattage), comes to evoke a certain muscular or glandular response following conditioning. When delayed conditioning is employed, however, it is found that sound and light stimuli of varying intensity can become effective conditioned stimuli and produce a response for which no specific conditioning was established. Similarly, using a particular kind of stimulus on the delayed time principle, it is possible to produce a large variety of responses. The establishment of a particular conditioned response to a variety of *related* stimuli (that is, stimuli in the same sensory field) or the establishment of a variety of *related* responses to a particular conditioned stimulus is called experimental generalization. Gradients of intensity can be worked out with both stimuli and responses on this basis. C. I. Hovland, M. J. Bass, and C. L. Hull of the United States, and Pavlov and his students, particularly I. S. Beritov and G. V. Anrep in Russia, have shown this with regard to *stimulus* generalization; W. N. Kellogg of the United States and V. M. Bekhterev of Russia have proved this with regard to generalization of *response*. The chief importance of this work is that it explains, by experimental techniques of great accuracy, why the human individual can display certain apparently unlearned responses, and why some stimuli unfamiliar to the subject can have an unanticipated effect on his behavior.

Reconditioning. Can a conditioned response, once established, be changed or done away with is a question which arises. The answer is that any conditioned response requires reinforcement by the unconditioned stimulus, or its equivalent, in order to continue to be effective. If the reinforcement is not provided, the conditioning weakens and ultimately disappears. Among human beings in particular, reinforcement may appear from sources that are not recognized as such, and thus continue a conditioning activity for a long time.

Another question often posed is: When a conditioning is for some reason undesirable, can it be changed? The answer is that it can. Watson showed how an emotional habit (fear of a rabbit) could be induced and then removed in a little boy. Many physicians in sanitoria have treated alcoholism and drug addiction on this basis. (See ALCOHOLISM.) The psychologist J. J. B. Morgan was one of the first to demonstrate that enuresis, or bedwetting, in children can be treated on this basis, and some pediatricians have used this method successfully. Knight Dunlap, another psychologist, has shown the applicability of conditioning to the retraining of speech defectives. A. Salter has written on conditioned response therapy in its relation to all types of personality disorders, from the simplest to the most complex, conceiving of all of them as problems in conditioning and reconditioning. See BEHAVIORISM; BRAINWASHING; COMPARATIVE PSYCHOLOGY; ENURESIS; HABIT; PAVLOV, IVAN PETROVICH; WATSON, JOHN BROADUS.

M. H. KROUT

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CONDON, EDWARD UHLER, 1902– , U.S. physicist, was born in Alamogordo, N.M., and studied at the universities of California, Göttingen, and Munich. In 1937 Condon was made associate director of the Westinghouse Research Laboratories and also served as advisory professor at the University of Pittsburgh. He was director of the National Bureau of Standards, 1945–1951, and then joined the research and development department of Corning Glass Works, Utica, N.Y. Condon helped develop the atomic bomb by his work on electromagnetic separation of U–235 from U–238 in the radiation laboratory of the University of California. He collaborated with Philip M. Morse in writing *Quantum Mechanics* (1929) and with George H. Shortley in writing *Theory of Atomic Spectra* (1935). See ATOMIC ENERGY.

CONDONATION is a forgiveness and pardon, expressed or implied, with full knowledge of past wrong, fault, or deficiency. Condonation is found principally in criminal law, torts, and divorce law, with diverse applications. Because a felony is considered a public wrong, the fact that the aggrieved party condones an offense will not bar a criminal prosecution. In many cases, however, the condonation of misdemeanors will relieve the perpetrator from criminal

prosecution. Because a tort is considered a private wrong the victim may condone the act; condonation under such circumstances will operate as a bar to subsequent action for damages.

In divorce law the defense of condonation is conditional upon the future good behavior of the erring spouse.

CHICAGO NATURAL HISTORY MUSEUM

California Condor, *Gymnogyps californianus*

CONDOR, a large, eagle-like bird of prey belonging to the vulture family *Cathartidae*. These carrion-eating birds have stout bills that are blunt and hooked. Their clumsily formed feet have dull, slightly curved talons incapable of seizing or holding prey. Their wings are broad and their tails even or slightly rounded. The condor's plumage is sooty black; its head and neck are usually bare, showing rough, often brightly colored, skin. Condors walk with a listless air, but are majestic in flight, soaring thousands of feet above the ground for hours without flapping their wings. Largest of all American birds, condors weigh about 22 pounds, are 4 to 5 feet long, and have a wingspread of about 10 feet. They build no nest but lay their single greenish white egg in mountain crags. The young are so dependent on the parents that nesting is possible only every other year. Fossils of the California condor, *Gymnogyps californianus*, have been found from the Tertiary period (see GEOLOGIC TIME). This almost extinct condor is found in a limited area in Southern California, although fossils indicate that Florida was once its habitat. The Andean condor, *Vultur gryphus*, is native to the westernmost crests of the Andes. These birds were once destroyed in great numbers for their wings and tails, which were shipped to Europe to be used as dusters. See BUZZARD; VULTURE.

CONDORCET, MARIE JEAN NICOLAS DE CARITAT, MARQUIS DE, 1743–94, French philosopher and mathematician, was born in Ribemont, Picardy. He showed promise as a mathematician at an early age, and at the age of 21 presented to the French Academy of Sciences his *Essai sur le calcul intégral* (1765). He was given a seat in the Academy in 1769 and was appointed its perpetual secretary in 1777. His work on the theory of probability was considered by many a valuable contribution to the body of mathematical knowledge.

A champion of the ideas of Voltaire and Rousseau, Condorcet was anticlericalist in religion, a constitutionalist in politics, and in matters of international relations a pacifist and anti-imperialist. In advocating universal suffrage, equal rights for men and women, civil marriage, birth control, separation of church and state, and compulsory public education, he anticipated the liberalism of the twentieth century; *Vie de Voltaire* (1787), in which he set forth some of these ideas, was widely read. Condorcet welcomed the French Revolution enthusiastically; he belonged to the Girondists, a political party less radical than the Jacobins, and was among the first to call for a republic. He became president of the Legislative Assembly, 1792, and presented a draft for the constitution of the Republic, 1793, which was rejected. Later he voted against death penalties for Louis XVI and Marie Antoinette and counseled moderation in the conduct of the revolution. He was labeled a dangerous independent and when the Girondists were outlawed, 1794, was proscribed as an enemy of the state. His friends found refuge for him at the home of Madame Vernet, widow of the sculptor, where he hid for several months. During this time he continued to take an interest in politics and managed to forward to the Committee on Public Safety several memoranda concerning affairs of state. In the few months at Madame Vernet's he also wrote his best known work, *Esquisse d'un tableau historique des progrès de l'esprit humain* (published posthumously in 1801), in which he traced human development through nine epochs of history, from the earliest phase up to the French Revolution, and predicted that a tenth epoch would see the ultimate perfection of humanity. This latter epoch he saw as putting an end to inequalities among nations and classes, and helping bring human nature to its ideal condition. The work influenced many later social thinkers, notably Auguste Comte. Fearing for the safety of Madame Vernet if she continued to shield him, Condorcet left her home, was captured, and sentenced to the guillotine. On Apr. 8, 1794, he was found dead in his prison cell, apparently a suicide. In spite of his proscription, Condorcet seemed never to lose faith in the spirit of the revolution, however much he deplored the conduct of some of its leaders. See GIRONDISTS; FRANCE, History.

CONDOTTIERI, the leaders of bands of mercenary soldiers, especially in Italy in the fourteenth and fifteenth centuries. Many of the early *condottieri* and their soldiers were foreigners, who sold their services to Italian cities and rulers, among them Sir John Hawkwood. (See HAWKWOOD, SIR JOHN.) Later *condottieri*, mostly Italian, used their military positions to win wealth and political power. Notable were the Sforza, who became dukes of Milan. (See SFORZA, FRANCESCO.) Since the *condottieri* engaged in war as a profession, with little concern for the city or cause that hired them, they often changed sides for better pay. Thus the enemy of yesterday might become an ally today, and so was inclined to prolong campaigns rather than bring them to a decision, and to shed as little blood as possible.

CONDUCTION, the transfer of net electric charge through matter. Such transfer constitutes an electric current, which is the net positive charge crossing a reference point in unit time. The unit usually used in measuring ordinary current is the ampere (see AMPERE).

Electric charge is a property of fundamental particles of matter and hence of atomic or molecular systems. An electric current flows through matter when these fundamental particles (see ELECTRON; ION), called carriers, exist under conditions which permit their migration or drift. Whenever an electric field is established in the material, through application of a voltage—that is, a difference in electrical potential—the result will be a force on each positive carrier in the direction of the field and on each negative carrier in the opposite direction. Thus the positive carriers drift with the field and the negative ones against the field. In metals, only free negatively charged electrons are capable of moving. To say that the positively charged carriers in metals move is incorrect.

The negative carriers or electrons (see ELECTRON), however, will move physically against the electric field, and their absence will create a positive region that will drift in an opposite direction. The actual drift of these charged regions is seldom more than a few centimeters a minute, but the transfer of electrical

energy takes place with the velocity of light. In either case the transportation of net positive charge is with the field. From this phenomenon comes the universal rule of simple conduction: the electric current has the direction of the electric field. The decrease of electric potential per unit distance is the electric field. It is directed from points of higher to points of lower potential. Since the current has the direction of the field, it also travels from higher to lower potential. This is somewhat analogous to a car rolling down a hill. The positive charge is the car; the field of force is the gravitational field. Both the car and charge move with the field.

The current has the direction of the electric field only in the case of simple conduction. Such is not the case in voltaic cells, motors, and generators. (See CELL; GENERATOR; MOTOR.) In all instances such as these the chemical or mechanical energy is converted to electrical energy, which requires work to be performed on the carriers. In simple conduction the charged carriers in an electric field are capable of doing work. This action is also analogous to the car and the hill. Work must be performed on the car against the gravitational field to move it to the top of the hill again. Likewise, chemical cells and electric generators do the necessary work to move the net positive charges against the field so that they in turn will be in position to do work again.

Electrical Resistance is that property of an electrical circuit or body which determines the amount of electrical energy converted to heat or radiant energy. It can also be viewed as an opposition to current flow. If current I flows through a conductor when the potential difference between the terminals is V, the resistance of the conductor is then $R=V/I$. The resistance R is measured in ohms, the practical unit of resistance. If one volt of potential difference is across a resistance of one ohm, one ampere of current will flow. A mile of copper wire that has a diameter of .76 centimeters would have a resistance of 1 ohm. A conductor with the function of providing resistance in an electrical circuit is called a resistor.

Ohm's Law, which is a statement of facts derived from precise experimental findings, states that for many conductors, including the metals in particular, the resistance is independent of the current or potential difference so long as the temperature of the conductor is not affected. When Ohm's law is obeyed, the conducting material is said to be linear. Nonlinear conductors are important, however, in many technical applications. For example, conductors made of a ceramic material called thyrite have a resistance which decreases as the potential difference increases. A thyrite conductor can be shunted across a power line, its resistance being sufficient to prevent excessive current drain. When lightning strikes the line, the reduced resistance of the thyrite allows the surge to be carried safely to the ground.

Electrical Conductivity is a measure of the conducting property of a given material. It may be defined as the current per unit cross-sectional area of the material per unit electric field. Suppose, for example, that a potential difference V is applied across a length l of wire of uniform cross section A. A uniform electric field V/l will be maintained both over the cross section and over the length of the wire. Thus, the current I for a given length and potential difference is proportional to the cross sectional area. The conductivity g is then given by $g=\frac{I}{A\,V/l}$ with the units of mho/cm. This equation effectively states that the larger the diameter the greater is the quantity of current the wire is capable of carrying, provided the length and potential difference are constant. It also states that when the wire obeys Ohm's law, so that the ratio of V to I is constant, the conductivity of the material is independent of the field strength. The reciprocal of the conductivity, that is $1/g$, is called the resistivity. A substance which has a high conductivity has a low resistivity. Actual materials represent an enormous spread in conductivity. For example, the conductivity of copper is 5.8×10^5 mho/cm, and that of fused quartz is of the order of 2×10^{-19}. (See EXPONENT, *Large and Small Numbers.*) A material of small conductivity is called an insulator. Frequently electrical measurements are expressed in conductance. It is the reciprocal of resistance, that is, $1/R$, and has the unit of mho.

Energy Loss in an electrical circuit in the form of heat is the result of resistance to conductance, except in the case of super-conductors. When current flows from higher to lower potential, the electric field does work on the carriers of charge. These carriers, in turn, dissipate the work in collisions. The energy loss appears as heat. (See JOULE.) The power dissipated, that is, the energy loss per unit time, in a conductor with a resistance of R when the current is I and the potential drop is V, is $P=IV=I^2R=V^2/R$, the alternate forms being deduced from the definition of resistance, $R=V/I$. Electric ranges and incandescent light bulbs represent applications of converting electrical energy to heat. The consumer purchases the dissipated power that has been converted into heat and then into useful work.

Types of Conduction. Metallic conduction is linear and the conductivity, which is large, generally decreases with rising temperature. An increase in temperature causes a greater frequency of collisions between the carriers (electrons) and the metallic atoms, hence the resistance to current flow will increase and the conductivity will decrease. Certain nonmetallic conductors such as carbon and porcelain have negative temperature coefficients, that is, their conduction increases with temperature. Electrolytic conduction involves both positive and negative carriers, called ions. (See ELECTROLYSIS; ION.) Gaseous conduction occurs in sparks, corona discharges, arcs, and Geissler tubes, for example. In gases the electrically-charged carriers are, at least in part, produced and their number maintained by the discharge itself in processes of ionization and bombardment. The phenomena depend on the gas and the electrode material and its geometry, the pressure, the temperature, and the applied potential difference. The electrical characteristics of such discharges have many applications, as in lightning rods, mercury rectifiers, and thyratron control tubes. Equally important is the use of gaseous discharges in neon- and mercury-filled tubes for illumination and display. See ELECTRIC LAMP; ELECTRONICS.

Semiconductors, such as germanium, are materials of moderate conductivity which increase with rising temperature. The carriers of electrical charge are electrons. Semiconductors may be made into rectifiers, whose resistance depends upon the direction of the applied potential difference. Transistors, which are capable of replacing vacuum tubes in many applications, are pieces of semiconductor material in which the current is governed largely by the potential of a control electrode.

Photoconductivity is an increase of conductivity produced in some semiconductors, such as lead sulfide, by irradiation with visible light or radiation of other wave lengths (see RADIANT ENERGY AND RADIATION). Photoconductive cells are used in motion picture sound reproduction and in physical research involving a measure of radiation.

Superconductivity is the phenomenon of infinite conductivity which occurs in a number of elements and alloys at temperatures close to absolute zero (see ABSOLUTE ZERO), such as can be produced by liquid helium. In superconductivity the electric field within the material vanishes, hence the energy dissipated vanishes. Thus a current once started in a superconducting ring continues to flow indefinitely without any supply of energy. Superconductivity is of great theoretical interest, since it shows on a large scale an application of the quantum mechanics which

is required to describe the behavior of physical systems of atomic size (see QUANTUM THEORY). See ELECTRIC CIRCUIT; ELECTRONICS; ELECTRODYNAMICS.
E. R. PECK

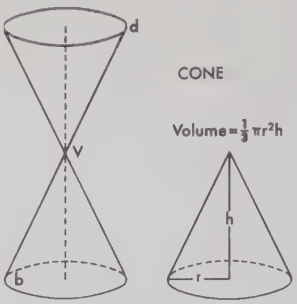
CONDUCTION, the steady transfer of thermal energy through matter without involving obvious motion of the matter itself. For example, a kettle conducts the heat from the stove burner to the water in the kettle. The heat within the water, however, is distributed largely by an entirely different process called convection (see CONVECTION), which involves a circulating motion of the water. Conduction is also to be distinguished from radiation (see RADIANT ENERGY AND RADIATION), the process of heat transfer in which energy is transported by visible or some other electromagnetic waves (see ELECTROMAGNETIC WAVES). Unlike conduction, radiation does not require matter as a medium to transfer the energy.

Temperature Differences govern heat conduction. If the temperature is uniform, no conduction of heat will occur. The direction in which heat will flow between two points, say A and B, depends upon the temperature difference. If the temperature of A is greater than that of B, the heat flow will be directed from A to B at a rate proportional to the magnitude of the temperature difference. For this reason a kettle will boil more quickly over a hot fire than a low one. Because the water will boil more quickly in a thin-bottomed kettle than in a thick-bottomed one, it follows that the rate of conduction also depends upon the distance through which the heat must flow. The temperature difference between the two points A and B divided by the distance between them is the average fall in temperature per unit length, or the temperature gradient. The amount of heat conduction per unit time is therefore proportional to the temperature gradient. The kettle in the example also conducts heat more rapidly if its base is broad and flat, which leads to the conclusion that the amount of heat per unit time is proportional to the area through which it can flow.

Metals, especially copper and silver, are good heat conductors. Good heat conductors are used in cooking utensils so that the temperature drop through the bottom of the utensil is small and the temperature over the area of the bottom is nearly uniform. Materials of low thermal conductivity, called thermal insulators, are used in construction of houses to help keep heat inside in winter and outside in summer. Similarly they are used to line refrigerators and cold storage rooms. Air is a very poor conductor. The pores in thermal insulators such as clothing, blankets, and building insulators of sawdust, cork, and fiber glass increase the effectiveness of these materials by trapping air and so decrease the conductivity of the material and prevent convection of the air.

Mechanism of Heat Conduction. Heat is energy which a material possesses by reason of the random motion of its atomic and molecular constituents. In gases and liquids the atoms, either singly or in clusters, are more or less free to wander about. The resulting collisions spread the energy from parts of the material at higher temperature, where these internal motions are faster, to parts at lower temperature where the internal motions are slower. In solids the atoms and molecules are not free to wander, but may vibrate and so pass thermal energy along to their neighbors. In metals, the electrons that are free to wander about, almost like gas molecules, provide the major mechanism of heat conduction. Since these electrons are also responsible for the electrical conduction of metals, it is not surprising that good electrical conductors (see ELECTRON; THERMODYNAMICS) are likewise good thermal conductors. In fact, the quantitative form of this statement is the law of Wiedemann-Franz, that the ratio of the thermal and electrical conductivities at any given temperature is the same for many different metals. See HEAT; HEATING AND VENTILATION.
E. R. PECK

CONE, a surface generated by a straight line moving so that it always passes through a fixed point called the vertex. The generating line, or generatrix, may move so as to follow a plane curve, called the directrix. Each position of the generating line, such as the lines *dvb* in the figure, is called an element of the cone. Since the generatrix is supposed to be of indefinite length, the surface consists of two parts, or nappes, on opposite sides of the vertex. If the directrix is a circle, the cone is a circular cone and its axis is the line joining the vertex and the center of the circle. In a right circular cone the axis is perpendicular to the plane of the circle; in an oblique cone the axis makes an oblique angle with that plane. The cone of elementary geometry is one nappe of a cone that has a closed curve for its directrix. Such a cone has the closed curve for a base and the perpendicular distance from the vertex to the plane of the base for its altitude. The volume of such a cone is one-third of the area of the base multiplied by the altitude. See CONIC SECTION; MENSURATION, *Solids*.



CONEMAUGH RIVER. See JOHNSTOWN.

CONENOSE. See ASSASSIN BUG.

CONE SHELL is a gastropod of the genus *Conus* that is found chiefly on the rocks and corals of tropical seas. The shell is cone-shaped, with many whorls, and seldom is more than 2 inches long. These shells are particularly noted for their variety of colors and patterns. Some species of *Conus* found in the South Pacific and Indian Ocean are poisonous.

CONESTOGA, an important Iroquoian Indian tribe, also known as the Susquehanna or Susquehannock. (See SUSQUEHANNOCK.) They were living in the Susquehanna River Valley and along Chesapeake Bay when Capt. John Smith met them in 1608. They were often at war with the Five Nations, who finally defeated them in 1675. The Conestoga were driven south and west, where they came into conflict with other tribes and with the English colonists in Maryland and Virginia. Some Conestoga were absorbed into other tribes and a remnant returned to Lancaster County, Pa., early in the eighteenth century and lived at peace with the white settlers, though their numbers dwindled. In 1763, enraged by Pontiac's rising and by other Indian attacks, a group known as the Paxton boys attacked the 20 remaining Conestoga, and exterminated them. See PAXTON BOYS.

CONESTOGA WAGON, the great land freight carrier of the late eighteenth and early nineteenth centuries in Pennsylvania and the surrounding country. Although there were individual variations, the Conestoga wagon characteristically had a high, boat-shaped body with a curved bottom, so that freight shifting on hills and rough roads would move to the center. Six or eight, sometimes as many as 13, bows were arched over the body; over them was spread the cover of stout white hempen cloth, corded down at the sides and ends. Traditionally Conestoga wagons had the underbody painted blue and the upper bright red. Wagons could be loaded to the top of the bows and had a capacity of four to six tons. Six-horse teams were usually employed to draw the wagon, and bells were frequently fastened to a metal arch attached to the harness. Drivers rode a wheel horse or drove from a board extending from the body. Conestoga wagon drivers were among the first to drive from the left and pass on the right.

Typical Conestoga wagons measured about 11 feet to the top of the front hoop, and 16 feet between

PENNSYLVANIA FARM MUSEUM OF LANDIS VALLEY

The Conestoga wagons of early Pennsylvania, made with beds sloping toward the center, and iron-covered wheels for maneuverability, were known as "turnpike schooners."

the front and rear ends of the wagon bed at the top. The rear wheels were 5 or 6 feet high, and the tires as much as 6 inches wide. The cover across the top might be 24 feet long and a Conestoga wagon and team might stretch to 60 feet.

The wagons seem to have developed in and around Lancaster County, Pa., about 1750. Wagons and the heavy draft horses that pulled them were named for the Conestoga Creek and area in that county. In Pennsylvania land transportation was necessary, and the Conestoga became the "ship of inland commerce." The wagons were a chief means of carriage westward to Pittsburgh and the country beyond. In the great days as many as 3000 wagons were in constant use carrying family possessions or provisions and eastern goods to the West, and returning with furs, skins, wheat, and flour for the eastern markets. See COVERED WAGON.

CONESUS LAKE. See FINGER LAKES.

CONEY ISLAND, resort district, S Brooklyn borough of New York, N.Y., extending from Gravesend Bay on the W to Rockaway Inlet on the E; on the Atlantic Ocean. Coney Island was formely separated from Brooklyn by the now-filled-in Coney Island Creek. It is divided into three sections: Sea Gate, a residential area on the west; the middle portion containing housing projects, an aquarium, and the famed 2-mile-long bathing beach with it boardwalk and amusement concessions, and, on the east, Manhattan and Brighton beaches, residential and resort areas.

CONFEDERACY, UNITED DAUGHTERS OF THE. See PATRIOTIC SOCIETIES.

New York's Coney Island is a popular amusement spot and bathing beach where thousands of bathers congregate for a breath of sea breeze and a cooling dip in the surf.

WIDE WORLD

CONFEDERATE STATES OF AMERICA, the 11 southern states which seceded from the United States and unsuccessfully attemped to maintain an independent government, 1861–65. With the secession of South Carolina and other states of the lower South in the winter of 1860–61 (see SECESSION) the next logical step was the formation of a new association among the seceded states. Delegates from six states—Texas later became a seventh—met at Montgomery, Ala., Feb. 4, 1861. The Montgomery convention served three purposes: it drafted a constitution for a new government to be known as the Confederate States of America, it elected temporary officials, and it acted as a provisional Congress.

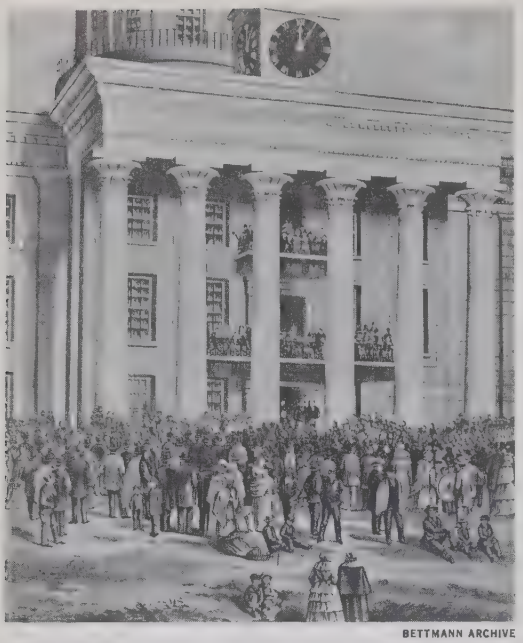
Government. Ultimately 11 states seceded and joined the Confederacy. Missouri and Kentucky, which did not secede, were still represented. (See UNITED STATES HISTORY, Map: *The United States at the Beginning of the Civil War, 1861.*) The permanent constitution, adopted Mar. 11, 1861, and ratified by the states the following year, was largely copied from the U.S. Constitution. Major differences were the explicit statement of state sovereignty; the protection of slavery, although the importation of slaves from Africa was forbidden; and the prohibition of protective tariffs, as distinguished from revenue. The president was given a six-year term, but was ineligible for re-election. Members of the president's cabinet, according to the constitution, might be granted seats, though not votes, in the houses of Congress; this power was not used in practice. The president was given the power to veto items in appropriation bills. The right of secession was not mentioned.

The Montgomery convention elected Jefferson Davis of Mississippi provisional president, and Alexander H. Stephens as provisional vice-president. At the elections for permanent officers in November 1861, Davis and Stephens were chosen for the same offices. See DAVIS, JEFFERSON FINIS; STEPHENS, ALEXANDER HAMILTON.

The new Congress and administration had to build the entire machinery of government, again largely in imitation of the United States. Provision was made for six executive departments. As secretary of state Davis appointed Robert Toombs, succeeded by Robert M. T. Hunter, and later by Judah P. Benjamin; secretary of the treasury, Christopher G. Memminger and, after 1864, George A. Trenholm, both of South Carolina; successive secretaries of war were Leroy Pope Walker, George W. Randolph, Judah P. Benjamin, James A. Seddon and John C. Breckinridge; secretary of the navy, Stephen R. Mallory; attorney general, Judah P. Benjamin, who moved to the secretaryships of war and then state, Thomas Bragg, Thomas H. Watts, Wade Keyes, and George Davis; postmaster general, John H. Reagan. District courts were created, but the Congress never established the Supreme Court provided in the constitution.

Most of the civil offices and buildings, as well as the forts and military posts, which had belonged to the United States, were taken by the states as they seceded. These were in most cases turned over to the Confederate government, and often offices were operated by the same men who had been officials under the United States. The United States post office continued to carry the mails through the south until June 1, 1861, and for months thereafter the Confederate officials had difficulty in securing a supply of stamps. A new currency had to be provided, and taxes levied and collected. Supplies had to be purchased, some of them abroad, and an effort made to establish relations with the rest of the world.

The capital was moved from Montgomery to Richmond, Va., where the Congress met in July 1861. Intended to please Virginia and the upper South, the move brought the capital into a vulnerable position near the border of the Confederacy.



BETTMANN ARCHIVE

This lithograph was made from a photo taken during the inaugural ceremonies when Jefferson Davis became president of the Confederate States of America, Feb. 18, 1861.

Though party divisions were not formal in the Confederacy, and Davis and Stephens had been elected without organized competition, dissension and opposition were not unkown. Congress and the newspapers afforded opportunity for attack on the administration. Moreover, the doctrine of states' rights gave rise to controversy. Davis and the Confederate government found some governors reluctant to send supplies and men out of their states, using constitutional grounds to justify their failure to act.

Military and Naval. From the beginning the Confederacy operated under the threat of war and, from the spring of 1861, under the reality. Despite their professed belief that secession was legal and could be peaceable, Confederate leaders knew that the Republican government taking office Mar. 4, 1861, was unlikely to agree. Preparation for war therefore was important in the early organization, and from Fort Sumter onward the prosecution of the war was the major effort. In no phase of life could the new government and its people develop normally, or be judged by peacetime standards.

The Confederacy had the advantage of interior lines, and of a defensive position, and a tremendous disadvantage in numbers and resources. The efforts to defend a long line and a number of positions led to a dispersal of forces and lack of concentrated effort. Davis' military experience gave him a special interest in the organization and direction of the armies, which critics have thought was not always helpful. The Confederate navy was largely made up of vessels seized from the United States or built abroad. Raiders did considerable damage to United States commerce, and the *Merrimac* (renamed *Virginia*) created alarm, but in the long run the larger number of Union ships prevailed both at sea and on the inland waters. See Civil War, American, and articles on individual battles and generals.

Diplomacy. Confederate hopes of success in maintaining the independency they asserted rested in part on Europe, and especially Great Britain. They desired and expected not so much military intervention as diplomatic recognition and financial assistance. Their expectations were based on faith in their cause and in the practical supremacy of cotton. Believing that England was dependent on the South for this basic crop, the Confederate government for the first months of the war deliberately withheld cotton from the foreign markets in the hope of forcing recognition. The effort failed. England and France recognized the belligerence of the Confederate States, but went no further. The pressure of cotton withdrawal was overmatched by a combination of factors: the importance of the North's wheat; the strength of antislavery feeling among the English people, especially the workers in the cotton mills; and the unwillingness of the British government to become embroiled, especially without assurance of Confederate success. The steady tightening of the blockade kept most of the cotton from going to Europe, whatever the Confederate policy, and made the use of cotton to purchase supplies and munitions impossible.

Finance and Economy. The Confederate government tried a variety of the three major methods of raising money: taxation, loans, and the issuance of currency. Some taxes were collected in kind, a step made necessary by the largely agricultural economy and by the lack of currency in many sections. Loans were attempted at home and abroad, on the credit of the government and on the value of the cotton held by the government. Only one of the foreign loans was made, that with the Erlanger firm in Paris. The currency inflation was steady and reached fantastic levels in the last years of the war.

The Confederacy started with a disadvantage in comparative development of industry and transportation. Shipyards, iron works, powder mills, obvious necessities for waging war, had to be built or expanded. Dependent previously to a considerable extent on the industrial growth of the North, southerners found many luxuries and some necessities hard to find, especially as the blockade grew more effective and cut off supplies from Europe, or raised the cost of what was run through the blockade.

Southern railroads had to bear a heavy burden in transporting troops and materials of war. The railroads and the entire economy suffered from the war. Beyond the direct destruction by Union armies, which was considerable and especially serious to the railroads, were the losses occasioned by the absence of men at the war, the emphasis on war production, and the failures of supplies and markets.

Life in the Confederacy. The war brought changes of magnitude to southern life and society. Beyond personal loss and separation, the war entailed social disorganization. Plantation owners lost some of their position, wives and daughters of the owners worked in ways they had not known before. Slavery and slave labor continued throughout the war, but even before emancipation the system was changed. Runaways, "contrabands" who found their way within Union lines, and slaves captured by Union forces accounted for some changes. The changed position at home, and the necessity in many cases for reliance on slave loyalty and on Negro labor, accounted for more.

In the spring of 1865, the pressure of Union armies and the effects of the blockade crumbled the Confederacy. Davis and his cabinet fled from Richmond before its capture, moving southward to join Gen. Joseph E. Johnston. Davis hoped to continue the fight, but the pressure on Johnston, which led to his surrender to Gen. William T. Sherman, Apr. 26, 1865, ended that hope. Davis continued to flee, but was captured May 10. The Confederate cabinet members were either captured or fled into exile, and the government collapsed though it was several months before the last troops surrendered. The four years of the Confederacy remained a dominant memory in southern history. See also United States History.

G. J. F.

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CONFEDERATE VETERANS, UNITED. See Patriotic Societies.

CONFEDERATION is a loose, usually temporary union of political, territorial, or other units, each of which retains the largest possible degree of independence. Usually, a confederation is a union or a league formed by several sovereign states for certain common purposes—usually defense, foreign relations, or tariffs—in which the delegated powers of the central authority are strictly limited. Stress is laid upon the sovereignty of the confederate members, which in some cases may retain the right of secession. A federation, on the other hand, is a closer, permanent union of states or provinces in which sovereignty is vested primarily in the federal authority.

Confederation often is a stage in the transition to a federation. The United States formed a confederation until the introduction of a federal constitution in 1789. After their secession from the federal union during the Civil War, the Southern states formed a confederation, the Confederate States of America, thus emphasizing the sovereign rights of the individual states. Other examples of a confederation are the German Confederation, established at the Congress of Vienna in 1815, and the Confederation of the Rhine, 1806–13. The Dominion of Canada, formed in 1867, has been termed a confederation, a misnomer which has been abandoned in favor of the term federation, corresponding more closely to the relative power position of the central and provincial governments. A confederation may also be a league of political, trade or other organizations, such as the Miners' Federation of Great Britain and the *Confédération Générale du Travail* in France.

CONFEDERATION, ARTICLES OF. See Articles of Confederation.

CONFEDERATION OF THE RHINE, an association of German states under the instigation and protection of Napoleon, formed in July 1806. The original treaty of confederation was signed for 16 states; ultimately the confederation included 36 states and almost all Germany outside Prussia and Austria. A number of smaller states lost sovereignty and many boundaries were revised in the establishment and expansion of the confederation. A diet or legislature was planned, but never met. The confederation furnished soldiers to Napoleon's armies and otherwise supported him, until the disasters of the Russian campaign and the rise of German national feeling led to dissolution in 1813. However, many of the legal and territorial changes brought about by the confederation were retained by the Congress of Vienna and continued in later German history.

CONFERENCE, a meeting convened for the deliberation of questions of mutual interest. A variety of international, intergovernmental, and interorganizational meetings are conferences. International meetings of representatives of sovereign states, once known as congresses, later came to be called conferences (see Congress). Intergovernmental meetings in federal states and empires are sometimes conferences (governors' conferences in the United States; dominion-provincial conferences in Canada; Commonwealth conferences in the Commonwealth of Nations). Less frequently conferences may be permanent organizations, such as the Governors Conference and the Conference of Catholic Colleges. See Hague Conferences.

CONFESSION, in law, either a voluntary statement by one person to another to the effect that he has committed a crime, or of his connection with one; or the admission of a prisoner, charged with crime, that he is guilty. A confession is not admissible in evidence against a prisoner if it was procured by an officer of the law under threats or false promises of favor. Otherwise a voluntary confession of crime is admissible, whether made to an officer or any other person. In a trial a prisoner cannot be convicted on his confession alone; there must be some evidence, however slight, tending to corroborate his statements. However, a prisoner charged with crime may plead guilty when arraigned, and will be sentenced without trial, except in capital cases. See Evidence.

CONFESSION, in religion, is a declaration of sins to some religious authority to obtain absolution. In the Roman Catholic and Orthodox Eastern churches the confession of sins to a priest is one of the necessary elements in the sacrament of penance. Among the Jews there was a Day of Atonement when the high priest made confession of sins for the whole people; this day (Yom Kippur) is still kept by the Jews with fasting and confession. In the early Christian church confession was made publicly before the congregation, but the inconvenience of open confession led gradually to private confession to a priest, who imposed the penance and pronounced the absolution. In 1215 the Fourth Lateran Council ordered that every mature Christian should make a confession at least once a year before a priest. The Council of Trent in 1551 reaffirmed the value of confession. This act is regarded by Roman Catholics as necessary for those guilty of "mortal" (serious) sin before the reception of Holy Communion.

During the Reformation the Protestant churches rejected penance as a sacrament and repudiated confession as an obligatory practice. Since Protestants believe in the priesthood of all believers, they regard confession as an individual obligation, which may be made in private, in public, or to a pastor or layman. Forms for general confession are used in congregational worship. Among Lutherans obligatory confession continued for a time but it was not regarded as a sacrament, and eventually the general confession came into use. The Church of England and the Episcopal church have a general confession which is followed by a form of absolution, but among Anglo-Catholics private confession to a priest has gained wide acceptance. Among Protestants there has been increasing use of private confession to the pastor. See Absolution; Sacrament.

CONFESSION OF FAITH, a formal statement of religious belief by a church or church group. A confession differs from a creed in that the latter usually is a brief statement used liturgically, while the former is a fuller summary of doctrine to define the dogmatic position of one church group. The great confessions were outgrowths of the Reformation. See Creed; Christianity; Reformation.

Among Lutherans the most famous summary is the Augsburg Confession of 1530; it was followed by the Apology for the Augsburg Confession (1532), the Schmalkald Articles (1537), and the Württemberg Confession (1551). The Formula of Concord (1580) attempted to reconcile varying opinions. See Augsburg Confession; Luther, Martin; Lutheranism.

The Reformed or Calvinist churches likewise drew up many confessions. The Sixty-Seven Articles of Zurich (1523) was issued by Huldreich Zwingli. The First Confession of Basle (1534) and the Second Confession of Basle or First Helvetic Confession (1536) attempted to bridge the gap between Luther and Zwingli. After this compromise effort failed, the Second Helvetic Confession of 1566 combined the views of Zwingli and John Calvin. In the Netherlands the Belgic Confession (1561) was generally accepted by

the Reformed church. In England the chief summary of Calvinism was the Westminster Confession (1645–47), which is accepted by many Presbyterian churches. In Scotland John Knox drew up the Scots Confession in 1560. See CALVIN, JOHN; CALVINISM; KNOX, JOHN; PRESBYTERIANISM; REFORMED CHURCHES.

The Thirty-Nine Articles (1562) are official in the Church of England, and with minor changes were adopted by the Protestant Episcopal church. The American Methodists, on John Wesley's advice, adopted 25 of the 39 articles. See CHURCH OF ENGLAND; METHODISM; PROTESTANT EPISCOPAL CHURCH; THIRTY-NINE ARTICLES, THE; WESLEY, JOHN.

The Baptists have no formal confession since they regard the New Testament as a sufficient basis of faith and practice. The Congregational churches and other churches in the Congregational tradition likewise have avoided confessions since with congregational autonomy each congregation may draw up its own statement. The Disciples of Christ were founded on the Bible alone. The Society of Friends, the Salvation Army, the Unitarians, and several other denominations use no formal confessions. See BAPTISTS; CONGREGATIONALISM; DISCIPLES OF CHRIST; FRIENDS, SOCIETY OF; SALVATION ARMY; UNITARIANISM.

During the Reformation the Roman Catholic church formulated its doctrines in the Decrees and Canons of the Council of Trent (1545–63). Other important Catholic statements were the Dogmatic Constitutions of 1869–70 and the Syllabus of Piux X in 1907 condemning all forms of modernism. See ROMAN CATHOLIC CHURCH; COUNCIL OF TRENT.

CONFESSIONS OF SAINT AUGUSTINE, consisting of 13 books, was written sometime in the years 397–400 by the Bishop of Hippo (Africa), St. Augustine, 354–430 (see AUGUSTINE, SAINT). The first 10 books are ostensibly autobiographical; the last three have been described as an exegesis of the book of Genesis. In spite of this seeming division, the 13 books constitute a unitary whole. *The Confessions of St. Augustine* has been called the "history of Augustine's heart," while the *Retractationes* (426–28), a chronological account of his works, with indications as to the occasion and the dominant idea of each, has been called "the story of his mind." These, together with his surviving letters, constitute the principal sources of direct biographical information about St. Augustine.

Because of its title, the *Confessions* has sometimes been confused with the "Confessions" of Rousseau, Don Juan, and others. But Augustine intended the word in the biblical sense of the Latin *confiteri*, literally "an acknowledgment." Augustine speaks not to readers, but to God. It has been said that Augustine's greatest work was his own life. But Augustine himself acknowledges that this "greatest work" was not his, but God's—*for* which Augustine was the material, and *to* which, in the *Confessions*, Augustine bears witness. Just as God created the Heaven and the Earth, so too did He create Augustine in the image of that which Augustine had been intended to be. "And being thence admonished to return to myself, I entered even into my inward self, Thou being my Guide: and able I was, for Thou were become my Helper. And I entered and beheld with the eye of my soul (such as it was) above the same eye of my soul, above my mind, the Light Unchangeable." But even as he acknowledges God's deed, he admonishes himself to remain true to it; he calls "to mind my past foulness, and the casual corruptions of my soul; not because I love them, but that I may love Thee, O my God." (Pusey's translation.) Hence, Augustine dwells on the period before his conversion. He knew of all, and embraced not a few of the many cults, and was even a celebrant of the rites of Manichaeism. The works of Plotinus enabled Augustine to shed materialism. Augustine received baptism during Lent, 387. Thus the war was won, though there remained many spiritual battles to be fought. One such, to make peace with his son, Adeodatus, was the biographical background of *De Magistro* (389, On Teaching), which should be read with the *Confessions* and the other autobiographical writings. F. S.

CONFIDENTIAL COMMUNICATIONS. See PRIVILEGE; EVIDENCE.

CONFINEMENT. See GESTATION; BIRTH AND LABOR; EMBRYOLOGY OF MAN.

CONFIRMATION, among Christians, a rite supplementary to baptism (see BAPTISM) and constituting full acceptance into the Christian fellowship. In the Roman Catholic and Eastern Orthodox churches confirmation is one of the seven sacraments. (See SACRAMENT.) The rite originated in the early Christian church; according to Acts (8: 14–17; 19: 5, 6) the apostles laid their hands on converts so that they might receive the Holy Spirit. In the Roman Catholic church confirmation is usually performed by a bishop, who makes the sign of the cross on the forehead of the candidate with chrism (a mixture of balm and oil), and also gives him a slight blow on the cheek to signify that he must be willing to suffer for Christ. Confirmation is believed to bestow a special grace which strengthens the Christian for the practice of his faith. Confirmation, according to Roman Catholic law, should be conferred at the age of discretion (7 years) and before first communion. In practice, confirmation in many countries of Spanish culture is conferred on infants shortly after baptism. And in many other countries it is conferred two or three years after first communion. In the Eastern church the priest anoints with oil blessed by the bishop, but there is no imposition of hands.

In the Church of England and the Episcopal church the rite is performed by the laying on of hands, but without anointing. Confirmation is necessary for admission to communion, and those who are confirmed renew the vows which were made in their behalf by their sponsors at the time of baptism. In America, Lutheran children are confirmed, after a public examination on the catechism, at the age of 13 or 14 (on completion of the eighth grade). Adults are often given informal private catechization followed by public confirmation. Most Protestant churches do not have the rite of confirmation.

Jewish confirmation, first recorded in 1810, is a ceremony of the Reform synagogue in which boys and girls publicly declare their adherence to Judaism and thus are received into the household of Israel. Confirmation, a development of the Bar Mitzvah, the rite in which the Jewish boy at age 13 accepts his responsibility as a member of the religious group, includes girls. There are Conservative and Orthodox congregations which retain the traditional Bar Mitzvah for boys and confirm girls in a ceremony of "consecration." Others have instituted a Bath Mitzvah service for girls at age 13.

CONFISCATION, the taking of private property by the state without adequate compensation. Under the due process clause in the United States no person may be deprived of life, liberty, or property without due process of law; the courts have held that any taking of property contrary to this provision is confiscation. (See DUE PROCESS OF LAW.) The taking of private property through the taxing power is not confiscation, even though the tax may be confiscatory in effect; nor when property is taken through the power of eminent domain, since there is a requirement that adequate compensation be paid. The slave owners charged confiscation after the Civil War when their property rights were abolished, as did also the alcohol beverage industry after the adoption of the prohibition amendment; whatever may have been the moral and political considerations, neither case involved legal confiscation since there was no taking of private property by the state. See CONDEMNATION PROCEEDING.

By the old common law of England confiscation was applied almost exclusively to the seizure by the state of stolen goods, stray cattle, and the goods

of a traitor. Under modern constitutional government it has little application, but it is generally employed as a punishment for treason and for active participation in an insurrection. The most prominent case of confiscation in modern times was the action of the revolutionary Communist government in Russia in expropriating and abolishing private property in the attempt to establish a socialist society. In the United States and Great Britain confiscation most commonly denotes the act of the state in seizing goods on which import duty or other revenue has not been paid when circumstances prove that the owner intended to defraud the government. It also sometimes applies to the sale of real property by the state for the collection of taxes. Confiscation and forfeiture are two sides of the same action; the state confiscates while the individual forfeits. See Common Law; Treason; Insurrection; Forfeiture.

In international law confiscation has been much used in wartime. Formerly, belligerent states often confiscated the property of enemy aliens, but this practice is less common today. In World Wars I and II the United States set up an Alien Property Custodian to take over the control of alien property within its jurisdiction to prevent trading with the enemy. Also, a belligerent may confiscate a neutral vessel (with the cargo) which is caught trying to run a blockade, and it may seize contraband of war bound for the enemy. See Blockade; Contraband of War; International Law; War, Law of; Neutrality.

CONFLICT is a mutually destructive relationship of individuals or groups, and involves a clash of interests or values. At the group level it is a conscious struggle with others for the same or similar objectives. At the person-to-person level the conflict may be conscious or unconscious. On an individual level conflict involves a personal inability to resolve two or more impulses which cannot function together at the same time. Both mental and emotional responses of human or subhuman organisms are part of conflict.

Forms of Conflict. Intergroup (between groups) and interpersonal (between individuals) conflicts take several major forms, which may be violent or verbal, with an intermediate phase of nonviolent passive resistance. The violent form is the most primitive and is particularly prominent in its interpersonal aspect among lower animals and primitive men. The nonviolent and verbal forms are the most constructive and most conducive to satisfactory compromise and resolution. Psychologists speak of a scale of non-co-operative interpersonal relations, which often begin unconsciously in emulation, or an endeavor to equal or excel, and advance through rivalry and competition to overt, violent conflict. Emulation, properly speaking, does not involve conflict but easily turns into rivalry, which is the mildest form of interpersonal conflict.

Violent intergroup conflict may take the form of rioting and lynching, strikes and lockouts, embargoes and international intrigue, civil war, revolution, and international war. Some group conflicts are based upon impersonal struggles between incompatible ideas or systems and are carried on by the groups who espouse them. According to the late sociologist E. B. Reuter, examples of systems between which there might develop conflict include evolution and special creation, capitalism and socialism, religion and science, and democracy and totalitarianism. In Reuter's opinion, "in such conflict there is no resolution short of the complete annihilation of one system or the other." It is obvious that some of these conflicts are verbal and others are not, and that motivations involved range from the economic to the racial and religious. See Apartheid; Anti-Semitism.

Psychologists under the leadership of the late Kurt Lewin and his followers, such as Ronald Lippitt and Herbert A. Thalen, have attempted to define intergroup conflict not only in interpersonal terms, but also in terms of the relationship of the individual and the social setting from which he derives his social beliefs. The Lewin approach is known as the group-dynamic, or field theory, explanation of human behavior. It emphasizes group behavior as fundamentally a matter of the motivations of men reflected against the impulses of other men as revealed in their outward behavior.

Mental Conflict. Basically every mental or emotional conflict involves two impulses which cannot function together at the same time. The impulses may be simultaneous approach and avoidance of a given situation, object, or relationship; avoidance of two given objects, situations, or relationships; or approach to two given relationships, objects, or situations. Conflicts can be met in several ways, including repression of one or another of the impulses; through compromise of some sort; through rational analysis of the factors involved, provided they can be clearly realized; or through psychotherapy, if the individual cannot himself achieve some resolution of the conflict. Frequently in a complex society persons are members of groups with conflicting values or opposed doctrines. Standards of the home and those found in the adolescent world are not always in harmony. The child with a religious background who becomes a student of natural science might find himself with personal conflicts as he tried to resolve questions answered differently by the natural scientist and the theologian, for example.

Relationships. Research in anthropology and sociology indicate that intergroup, interpersonal, and mental or emotional types of conflict are interrelated, and that intergroup conflicts have a direct relation to mental or emotional conflicts of group leaders, as in the cases of Napoleon, Hitler, Stalin, and Lenin. The tensions existing between groups are reflected in the emotional lives of individuals, and thus can become the source of personal mental or emotional discord. Psychiatrists and clinical psychologists have repeatedly found in their studies of marital situations and the interrelations of parents and children that interpersonal conflicts may lead to mental or emotional difficulties and, conversely, that emotional or mental conflict can lead to interpersonal conflict. See Psychoanalysis; Psychology; Social Psychology.

M. H. Krout

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CONFLICT OF LAWS, the conflict between the laws of different legal jurisdictions. The conflict may be an inconsistency, an opposition, variance or a difference in the laws or the application of the laws of different legal jurisdictions—nations, states, territories, court districts, and circuits. If the conflict pertains to the private rights of private citizens, it becomes a part of private international law; if the controversy is between nations, involving public rights of countries, it is a part of public international law.

Although at times it may seem that *conflict of laws* connotes strife between the courts, that is not actually true. When a conflict in the law is before a court in a matter to be decided by him, there may be a conflict in the mind of the judge as to just what law to apply in justice to the parties. It becomes a question for the judge to determine whether to apply the law of his own jurisdiction or that of the other nation, state, territory, court district, or circuit. For example, sometimes a court must decide whether the law of the place of the transaction, called the *lex loci contractus*, is to govern the parties and the subject matter before him, or the law of his own jurisdiction, called the *lex fori*. Some authorities point out that the purported conflict in the law is not really genuine, that it

actually does not happen—that the law to be applied by the court is merely a choice of laws to be made by the trial judge.

Primarily to avoid conflicts in the law, the National Conference of Commissioners on Uniform State Laws was organized in the last decade of the nineteenth century. State laws provide that the commissioners be appointed by the governors of their respective states. The conference meets annually for six days. At that meeting the commissioners consider the uniform and model acts which have been drafted by the conference committees throughout the year. Since its inception the conference had drafted and approved 98 uniform and model acts up to Nov. 1, 1955. One or more of those acts have been adopted by each of the 53 U.S. legislative jurisdictions. The first uniform act approved by the conference was the Uniform Negotiable Instruments Act, approved in 1896. Other important uniform acts and the dates of their approval by the conference are: Uniform Sales Act, 1960; Uniform Warehouse Receipts Act, 1906; Uniform Bill of Lading Act, 1909; Uniform Stock Transfer Act, 1909; Uniform Conditional Sale Act, 1918; Uniform Fiduciaries Act, 1922; Uniform Written Obligations Act, 1925; and the Uniform Trust Receipts Act, 1933. In addition to those acts, in co-operation with the American Law Institute, the National Conference of Commissioners on Uniform State Laws over a period of years prepared and drafted what is known as the Uniform Commercial Code. Some parts of the foregoing uniform acts have been incorporated in this new uniform code. Since its final draft in 1951 one jurisdiction, Pennsylvania, has adopted the new code.

Because of the conflict in the laws pertaining to divorces, and to stifle "quickie" and "tourist" divorces, the National Conference of Commissioners on Uniform State Laws in 1948 drafted and approved the Uniform Divorce Recognition Act, which has since been adopted by nine states. That act is particularly potent to the situation in which a citizen of one state migrates to another for the avowed purpose of getting an easier divorce. Yet the conflict in divorce laws has met with almost universal dissatisfaction, which has given impetus to the movement largely sponsored by civic bodies and lawyers' associations to have a national uniform divorce law.

Article IV, Section 2, of the U.S. Constitution provides that full faith and credit shall be given in each state to the public acts, records, and judicial proceedings of every other state. The application of that constitutional provision is called, in legal parlance, comity among the states (that is, courtesy between legal jurisdictions, respect for each other's laws). But the courts have held that even though they may have no particular law in a state that is called upon to apply the law of the foreign jurisdiction, if the law of the foreign state contravenes the public policy of their own jurisdiction the courts will not recognize or give effect to the law of the other state. For example, an agreement by which one of the parties promises not to marry if he receives a certain sum of money upon the death of the other may be a valid agreement in the jurisdiction where it is entered into, but will not be enforced under the principle of *comity* in a state where such a contract is held to be against public policy. However, as a general rule, if an agreement is valid where made, it is valid everywhere, except (1) if it is to be performed in another jurisdiction, there the law governs; (2) if the agreement is against the morals of the state where it is sought to be enforced; (3) if it is against the constitution or laws of the state where a lawsuit is commenced; or (4) if the agreement is against the public policy of the legal jurisdiction where suit is brought.

There are, of course, other general rules which are universally applied to a conflict of laws depending on the subject matter before the court. For example, a case involving a personal injury arising out of an automobile accident, where no contract is involved, and called in law a *tort* action, is governed by the law of the place where the injury occurred. A suit involving real estate is governed by the law where the property is situated. In the case of personal property, which is capable of being handled and moved about, its assignment, transfer, or disposition is governed by the law of the owner's domicile.

It is to be observed that while conflict of laws is troublesome to litigants and the courts, the trend to make laws more uniform to the end that conflict is abolished seems to be rapidly gaining momentum.

HERMAN B. GOLDSTEIN

Geological Conformity

CONFORMITY, GEOLOGICAL, is a type of formation characterized by a series of deposits that follow one another without interruption or significant changes in the nature of the rock or fossils in the strata. Conformable succession indicates uniform conditions of sedimentation following the normal sequence of geologic age. A disconformable deposit occurs where the process of sedimentation was interrupted by a period of erosion. If a deposit of newer rocks is laid upon a set of older rocks that have been tilted and have undergone a process of erosion and transport, the deposit is called unconformable and is characterized by a break in the geological record and by nonparallel planes.

CONFUCIUS, 551–479 B.C., Chinese sage whose philosophy influenced the civilizations of China, Japan, Korea, and Vietnam. Confucius was born in modern Shantung in northern China. His family name was Kung, his given name Chiu, but the Chinese have usually called him "Grand Master Kung" (*Kung fu tzu*, westernized as "Confucius"). He was a descendant of an illustrious family but was left fatherless at an early age and spent his youth in poverty. He was married at the age of 19 and had a son and two daughters. In his early twenties he served for brief periods as keeper of public herds and granaries. Although faced with a crumbling feudal society, the decline of the House of Chou, continual warfare among the feudal lords, and moral and social chaos, Confucius chose a career of public service and teaching. In 501 B.C. he accepted a government position in his own state of Lu and later became prime minister—a post which he resigned when he found that the ruler was more interested in the dancing girls sent over from a neighboring state than in social reform. In 497 B.C., Confucius set out on a 13-year odyssey, wandering from state to state with his pupils, offering advice and service. His efforts met with little success, however; he was ignored, driven away, and even met with threats against his life. Finally, tired and disappointed, he returned to Lu to teach and write.

If he failed as a reformer during his lifetime, Confucius succeeded tremendously as a teacher and as "Great Perfection," "Ultimate Sage," and "Foremost Teacher." He was the first private teacher in China, the first to devote his whole life to teaching, and the first to teach the total development of man instead of "statesmanship" alone. He declared, "In education there is no class distinction"; and his pupils, about 3000 in all, came from every stratum of society. Although he said, "I transmit but do not create," he

was creative in more respects than one. He was warm and friendly, yet stern; humorous, yet serious. Self-taught, he came to be considered the most learned man of his time. Scholars no longer believe that Confucius edited the so-called "Confucian Classics"—books of poetry, history, music, and ceremonies—or the *Book of Changes*; but they do agree that he wrote *Ch'un Ch'iu* (Spring and Autumn Annals), which was the first attempt to write a systematic Chinese history apart from myth and legends. This work contained moral judgments which were to become the standard of ethics for Chinese government for some 2000 years.

Teachings. The most reliable information on the teachings of Confucius comes from the collection of his sayings called *Lun-yu*, or the *Analects*. "It is man that can make truth great," he said; he was therefore most concerned with man. He taught "literature, moral conduct, loyalty, and good faith," filial piety, brotherly respect, righteousness, propriety, peace; the practice of "earnestness, liberality, truthfulness, diligence, and generosity," "mastering oneself and returning to propriety," being "respectful in private life, earnest in handling affairs, and loyal in one's association with people." These and other virtues are summed up in the "Three Universal Virtues" of Wisdom, Love, and Courage, roughly corresponding to the intellectual, spiritual, and physical sides of man. In short, he taught "Perfect Virtue," the cultivation of which he considered as the supreme duty of man. He called the man of perfect virtue the "Superior Man," or "Gentleman." Previously this term had meant gentleman by birth, but Confucianism radically changed it to mean gentleman by character, a revolutionary concept which lessened the hold on China of feudalism and class distinction by birth. A superior man should not only be good in himself; he should serve society. "He considers a heavy burden and a long course as his own. . . . Only with death does his course stop." Therefore, a good man, "wishing to establish his own character, also seeks to establish the character of others, and wishing to succeed, also seeks to help others succeed." This is love (*jen*), Confucius' most discussed subject, which involves conscientiousness on the one hand and altruism on the other. As such it is the Golden Rule, stated negatively: "Do not do to others what you do not want them to do to you."

The perfection of both the individual and society, as understood by his immediate followers, requires the successive "Eight Steps": investigation of things, extension of knowledge, sincerity of the will, setting the heart right, cultivation of the self, family harmony, national order, and world peace. Thus an ideal society starts with learning and culminates in peace. But unfortunately, Confucian learning was too much confined to books and so failed to develop the natural sciences. The goal of achieving an ideal society, however, was never lost. An ideal society is one in which the "Five Human Relations" are fulfilled—affection between parents and children, righteousness between ruler and subordinates, distinction of functions between husband and wife, order between elders and young, and good faith among friends. On the part of government, Confucius and his followers, especially Mencius (371–?289 B.C.), proposed that only virtuous and talented men should rule. They insisted on maintaining the feudal structure and restoring power to the king of Chou, but they also insisted that a king rules through the mandate of heaven, which is fulfilled only when the people enjoy happiness and prosperity. Otherwise the ruler should be replaced, by revolution if necessary. A good ruler, for Confucius, is one who regards his country as a family and the people as his children; he reigns through moral example rather than by force; relies on education, "rectification of names" and ranks, ceremonies, and music for social order rather than punitive measures; and elevates capable men to responsible positions regardless of birth and social status. This last principle led to the development of the civil service examination system, open to all, which operated in China from the seventh through the nineteenth century, and which was partially adopted by France, England, and the United States.

Confucianism. After the death of Confucius, Confucianism developed in two directions, one led by Mencius who believed that, as human nature was originally good, government should rely on moral example and social education; the other led by Hsun Tzu (298–238 B.C.), who taught that human nature was originally evil, and that government, therefore, should depend upon regulation through law, music, and ceremonies. In the long run, Mencius' ideas became the orthodoxy. After struggling against totalitarian Legalism, which proved too brutal for the Chinese, and quietistic Taoism, which was too negative, Confucianism was chosen as the state cult in the second century B.C., and dominated Chinese government, society, education, and literature until the twentieth century. In the eleventh century neo-Confucianism developed, with new ideas of "nature" and "principle" to support Confucian ethics, explaining that all men are basically good and equal because they are endowed with universal "nature" according to the "principle" which underlies all. "Nature" and "principle" are good because it is the characteristic of heaven and earth to create, to produce, to give life, and therefore to love. This was through many centuries the essential outlook of the Chinese, despite the fact that some traditional institutions which Confucianism sponsored, such as the monarchy, different standards for men and women, and the old education system, were altered. But Confucianism was flexible, and survived scores of dynasties.

Is Confucianism a religion? Confucius did not speak of spiritual beings and seldom spoke of fate. When asked about spirits and death, he answered that we could hardly know these when we did not yet know man and life. He advised his followers to "respect spirits but keep them at a distance," because he wanted men to be the masters of their own destinies. He prayed, and believed in and praised heaven; however, heaven was not a "person" to him, but a spiritual reality. Confucius was more interested in man's mind and attitude in religious matters than in the philosophy of an after life, and for this reason he was very particular about the careful observance of religious rites, including the three-year mourning period after a parent's death. To him ceremonies were expressions of one's inner feelings. In short, he was religious, but his system was not an institutional religion; there is no Confucian bible, creed, priesthood, or church, and Confucius himself was not deified. WING-TSIT CHAN

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CONGAREE RIVER. See SANTEE RIVER.

CONGER EEL is a salt water eel belonging to the family *Leptocephalidae*. Conger eels, *Conger oceanicus*, are slender, elongate, scaleless fish that lack pelvic fins. The adult eel spends most of its life in coastal salt water, with the exception of short migrations offshore into deeper waters to spawn. Males usually are not longer than 2 feet but females may reach lengths of 8 feet, and weigh as much as 130 pounds. The conger eel is found on both sides of the Atlantic, but not on the West Coast of the United States. See EEL.

CONGESTION, or hyperemia, is an excess of blood in any tissue. This condition may be the result of an increase in the flow of blood to the area. In this case the congested area is swollen and red, and is warmer than the surrounding tissue. Congestion may also be the result of a decrease in the outflow of blood. In this form of congestion fluid oozes from the blood into the tissues, producing the characteristic puffiness called edema. When tissues are unusually active for a

time they require additional nourishment, which is supplied by a greater inflow of blood, producing congestion (see CIRCULATION OF THE BLOOD). Such congestion is a part of the inflammation resulting from an injury. Disturbances of the nervous system may also increase the blood flow to a certain area, as will the direct application of heat or irritating substances. Widespread congestion from slowing of blood flow through the veins is often a consequence of impaired heart action. Localized congestion may be the result of obstruction of blood flow in a vein (see THROMBOSIS AND EMBOLISM) or of external pressure.

CONGLOMERATE, a rock consisting of coarse pebbles, usually rounded and held together by a matrix of clay, sand, or other such materials, or cemented together by deposited mineral matter. Breccia is a type of conglomerate consisting of pebbles which originated from mud. These pebbles with slightly rounded or angular edges are held together by a matrix of limestone, dolomite, or sandstone. SEE BRECCIA; ROCK.

CONGO, BELGIAN. See BELGIAN CONGO.

CONGO, FRENCH. See FRENCH EQUATORIAL AFRICA.

CONGO EEL or **CONGO SNAKE** is a North American eel-like salamander, *Amphiuma means*. Not related to the true eels of the bony fish group, the congo eel is black, about 3 feet in length, and appears to be a blunt-nosed, wide-mouthed eel. It has a small head, lidless eyes, one pair of gill slits, four vestigial limbs, and a slimy mucus coating. Found in muddy, quiet waters in southeastern United States, the congo eel feeds on mollusks, crustaceans, annelids, small fish, and members of its own species. The female lays her eggs on land, and protects them and keeps them moist by coiling her body around them. The young hatch in late summer and are about 3 inches long. See SALAMANDER.

CHICAGO NATURAL HISTORY MUS.

Congo Eel

CONGONHAS, formerly Congonhas do Campo, town, Brazil, S central Minas Gerais; 43 miles S of Belo Horizonte, to which it is connected by rail and highway. Located in a manganese and iron mining district, Congonhas is famous for the Senhor Bom Jesus de Matozinhos Sanctuary. This eighteenth century baroque church has some of the finest sculptures of António Lisbôa (Aleijadinho). Pop. (1950) 3700.

BRAZILIAN GOVT. TRADE BUR.

***The Prophet Jonas,* one of the fine pieces of church sculpture at Congonhas, done by Lisbôa.**

CONGO RIVER, Belgian Congo, French Equatorial Africa, and Angola, rises in SE Belgian Congo, in the province of Katanga, on the Katanga Plateau, 70 miles W of Elisabethville, and flows generally N, NW, W, and SW to an estuary on the Atlantic Ocean. With a length of about 2900 miles, the Congo ranks as the second longest African river after the Nile. The vast drainage basin of the Congo River covers nearly 1.5 million square miles, including most of the Belgian Congo, much of French Equatorial Africa, northern Angola, and western Northern Rhodesia. The upper reaches of the Congo are often known as the Lualaba, with the Lufira, Luvua, Lukuga, Luama, and Ulindi rivers as major tributaries. The Lualaba is navigable below Bukama, about 250 miles from its source, and the river passes through several lakes, the largest of which is Lake Upemba. Below Kongola, the Lualaba flows through a deep gorge which obstructs navigation. After Kindu the Congo is navigable down to Ponthierville where a series of rapids, known as Stanley Falls, again impedes navigation. Railroads from Kabalo to Kindu and from Ponthierville to Stanleyville circumvent the unnavigable portions of the Lualaba. Below Stanleyville the river is generally called the Congo. Principal tributaries of the Congo proper are the Lomami, Aruwimi, Kasai, Itembiri, Mongala, Lulonga, Ruki, Ubangi, and Sangha rivers. After Stanleyville the Congo generally flows slowly and varies in width from 1 to 10 miles. Between Stanleyville and Stanley Pool, near Léopoldville, a distance of more than 1000 miles, the river is navigable for large river boats, principally sternwheelers.

The Congo is open to shipping throughout the year, although sand bars are a navigational hazard. Stanley Pool, a widening in the river channel, is located about 350 miles from the estuary and marks the lower limit of river navigation. Below Stanley Pool is yet another series of rapids known as Livingstone Falls, which is bypassed by a railroad between Léopoldville and Matadi.

The estuary of the Congo is from 5 to 10 miles wide, with low mangrove-fringed shores and numerous islands of silt. Ocean vessels can ascend the Congo estuary as far as Matadi, about 100 miles from the Atlantic. In contrast to most tropical rivers the Congo has a fairly even rate of flow, from the fact that its tributaries lie on both sides of the Equator. Thus low stages in the southern tributaries tend to be compensated by high stages in the northern tributaries and vice versa. The Congo River system is one of the great

BELGIAN GOVT. INFORMATION CENTER

The Delcommune Dam and hydroelectric power station on the Lualaba River (Upper Congo), serves part of Katanga (Belgian Congo), famed for copper and uranium mines.

transportation routes of equatorial Africa and, in conjunction with railroads, forms the main trade route of the Belgian Congo. The Congo's estuary forms part of the border between Belgian Congo and Angola, and from its confluence with the Ubangi River to a point about 80 miles below Léopoldville the Congo forms a section of the boundary between Belgian Congo and French Equatorial Africa.

The mouth of the Congo was discovered in 1484 by the Portuguese Diogo Cam and little was known of the great river until the nineteenth century. In 1816 the British naval captain J. K. Tuckey investigated the lower reaches of the river and from 1866 to 1871 David Livingstone explored its headwaters. In 1884–87 Sir Henry Morton Stanley journeyed down the river in what is now the Belgian Congo from Nyangwe, Kivu Province, to Boma, Léopoldville Province, demonstrating that the Lualaba and the Congo were one stream. See Brazzaville; Coquilhatville; Léopoldville; Belgian Congo; Stanley Falls; Stanley Pool; Stanleyville.

CONGREGATION, an assembly of persons, especially one meeting for religious worship; also the group of persons belonging to a local church or synagogue. In Protestantism the local congregation is the governing unit in many denominations. In the Roman Catholic church, however, congregation sometimes refers to one of the 12 offices of the Roman Curia, such as the Sacred Congregation for the Propagation of the Faith, and sometimes to a type of religious community. In general, a religious congregation is one in which only a simple vow is required but in a religious order the solemn vow is taken. See Congregationalism; Monasticism; Roman Catholic Church.

CONGREGATIONAL AND CHRISTIAN CHURCHES. See Congregationalism.

CONGREGATIONALISM, a system of church organization and government in which the local church has complete autonomy; also a denomination or fellowship group under the General Council of the Congregational and Christian Churches. Congregationalism is one of the chief forms of church organization and has always had a prominent place in religious life in the United States. It is based on the doctrine that each local congregation has Jesus Christ as its sole head. The various congregations are related only as fellow members in the family of God. The congregational polity is found also among the Baptists, the Disciples of Christ, the Unitarians, and in many of the smaller denominations in the United States.

Beginnings of Congregationalism. In England the Reformation developed along three distinct lines: Anglicanism, Puritanism, and Separatism. The Anglicans abolished papal authority but retained many Roman Catholic features in their state church. The Puritans demanded a "purification" or drastic reformation; they wanted to remain within the state church, and hoped to gain control of it. (See Puritanism.) The Separatists or Independents, a much smaller group, held that the Church of England was too corrupt to be reformed, and therefore withdrew from it. Congregationalism developed out of the last group. About 1580 Robert Browne, a dissenting clergyman, organized at Norwich an independent congregation which refused "all ungodly communion with wicked persons." Because of persecution Browne and his group fled in 1581 to the Netherlands, where the congregation soon broke up. Browne published several books, including *A Treatise of Reformation without Tarying for Anie*, in which he held that the church is a body of believers united by a covenant independent of the state, and that each local congregation should be governed by its own officers. Browne himself later accepted ordination in the Anglican Church, but his early principles were long known as Brownism.

In 1604 John Robinson, an independent clergyman, became pastor of a congregation already organized at Scrooby. In 1608 the group fled to the Netherlands to escape persecution, but not wishing their children to become Hollanders, they decided to go to America so that they could remain Englishmen. In 1620, after crossing the Atlantic in the Mayflower, a small group of "Pilgrims" founded a settlement at Plymouth. See Mayflower; Pilgrims, The; Plymouth Colony.

The Pilgrims were soon followed by a large group of Puritans, who came to New England to escape persecution. In England the two groups had been antagonistic, but in America the Puritans soon accepted the principles of Congregationalism. From 1630 to 1640 thousands of Puritans came to America. Congregationalism became the state religion in most of New England, and dissenters were expelled. For many years other denominations were excluded from Massachusetts, but after 1700 the Episcopalians, Baptists, and Quakers were tolerated.

Development of Congregationalism. The chief event of the eighteenth century was the "Great Awakening," which was started in 1734 under the preaching of Jonathan Edwards. (See Edwards, Jonathan.) In 1801, when the Westward Movement began, the Congregationalists and Presbyterians entered into a "Plan of Union" for co-operation on the frontier; this plan continued in effect until 1852, when the Congregationalists withdrew because they believed the system had worked to their disadvantage.

When the Protestant missionary movement began, the American Board of Commissioners for Foreign Missions was organized in 1810. The Presbyterians and other groups joined in this board, but later as denominational consciousness became accentuated they withdrew one by one until the organization was left in the hands of the Congregationalists. In 1826 the American Home Missionary Society was founded on the same basis, but again the other groups withdrew; in 1861 the organization was renamed the Congregational Home Missionary Society.

Soon after 1800 a split developed between the Trinitarian and Unitarian wings of Congregationalism. In 1819 William Ellery Channing in a sermon rejected Calvinism and laid down the principles of Unitarianism. The split widened, and by 1840 the

division was complete. The Congregationalists lost some 100 churches in New England, and many others were divided. See UNITARIANISM.

Another development was the slow growth of denominational consciousness among the separate and independent churches. The first national meeting of American Congregationalists was held in Albany in 1852, and others were held in 1865 and 1871. At the 1871 meeting provision was made for a triennial national council, which later became biennial. In 1913 the national council gave definite recognition to the Congregational churches as an organized fellowship with specific purposes and methods.

Congregational and Christian Churches. In 1931 there was a merger of the National Council of the Congregational Churches in the United States and the General Convention of the Christian Church, forming the General Council of the Congregational and Christian Churches. The union of these two bodies was easy since both had the same kind of congregational polity. The Christian Church originated early in the nineteenth century from several independent movements, one of which was led by Alexander Campbell. (See CHRISTIAN CHURCH; CAMPBELL, ALEXANDER.) Since the union, many of the local groups have continued to be called "Congregational" or "Christian," while others have taken the name of "Congregational Christian." After World War II the Congregational Christian Churches worked out a merger plan with the Evangelical and Reformed Church; the proposal was approved by both groups and was scheduled for completion in 1950, but was delayed by court action begun by a minority group of Congregationalists. In 1953 the New York Court of Appeals upheld a judgment which permitted the churches to proceed with their merger plan. In 1955 the two denominations voted to consummate the union in June 1957, under the name "United Church of Christ." This plan was confirmed in 1956.

Characteristics of Congregationalism. Each local church elects its own minister and officers, writes its own covenant and constitution, holds title to its own property, and is in full control of its own affairs. Each congregation has fellowship ties with other congregations and works with them through state conferences and the General Council to promote the total work of the fellowship. Worship is essentially nonliturgical although some churches make use of a certain amount of form and liturgy. There is no official creed or confession, but there has been general adherence to the statement of faith adopted by the National Council in 1913.

Congregationalism in Other Countries. The Puritans in England remained in the state church until after the Restoration of Charles II in 1660. In 1662 the Act of Uniformity excluded from the Anglican Church all who would not conform. Thereafter the Puritans had to become nonconformists and dissenters; in time they established their own churches, some becoming Congregationalists, some Presbyterians. Since that time the Congregationalists have been one of the leading free churches of England. From the British Isles, Congregationalism spread into all the British dominions and into many of the colonies. In Canada the Congregationalists in 1925 merged with the Methodists and most of the Presbyterians to form the United Church of Canada. In India the Congregationalists in 1947 joined with other Protestant denominations to form the Church of South India.

Statistics. In 1955 the Congregational Christian Churches had 1,298,205 members in the United States. In England and Wales the Congregationalists had 223,008 full members in 1951. Membership figures in other countries are as follows: Union of South Africa, 225,382 (1946); Australia, 63,243 (1947); and New Zealand, 6824 (1951).

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CONGRESS is an important meeting or conference, or a legislative or other deliberative assembly. Important international meetings of sovereigns or their plenipotentiaries for deliberation and settlement of mutual problems were once called congresses. The Congress of Münster, 1648, ending the Thirty Years' War, was the first international assemblage to recognize the principle of balance of power. The Congress of Vienna, 1815, which convened after the defeat of Napoleon to draft a treaty of peace, for the first time discussed social and economic problems, such as the slave trade and navigation on international rivers. The Congress of Paris, 1856, which followed the Crimean War, made an important contribution to the international law of war with its Declaration of Paris (see PARIS, DECLARATION OF). Other important congresses were held at Aix-la-Chapelle, 1668, 1748, and 1818; Troppau, 1820; Laibach, 1821; and Berlin, 1878.

After the end of the nineteenth century the term congress was gradually replaced by that of conference, as in the Hague conferences in 1899 and 1907, the Peace Conference of Paris, 1919, and the Yalta and Potsdam conferences in 1945.

In the United States the national legislature has been called the Congress since the American Revolution, when the representatives of the original 13 states met in the Continental Congress in 1787 and incorporated the body of the Congress into the U.S. Constitution which they drafted. Many of the Latin American republics adopted the term for their national legislative assemblies. Periodic meetings of private organizations as well as international scientific, cultural, humanitarian, or other meetings are also called congresses. See DIPLOMACY; INTERNATIONAL RELATIONS.

CONGRESS, LIBRARY OF. See LIBRARY OF CONGRESS.

CONGRESSIONAL COMMITTEES. See COMMITTEE, *Legislative Committees.*

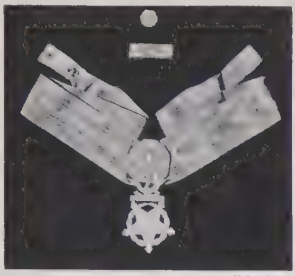
CONGRESSIONAL GOVERNMENT is a type of government in which the legislature and the executive are separated and made relatively independent of each other. The United States has a congressional government, with both the Congress and the executive being elected directly by the people and vested with separate but co-ordinate powers. In contrast is the cabinet government that exists in Great Britain, Canada, and Australia, where the executive is actually a standing committee of the parliament, responsible to it and dependent on its continuing support.

Underlying the concept of congressional government is the fear that concentration of power may lead to tyranny. By introducing separation of powers, the framers of the U.S. Constitution hoped to prevent such concentration of power.

Congressional government is especially related to the period following the American Civil War when Congress dominated the federal government. In his *Congressional Government* (1885) Woodrow Wilson described congressional government as essentially a government by congressional committees. Charging such a system with irresponsibility, lack of unity, and ineffectiveness, Wilson unsuccessfully advocated the introduction of some features of the British cabinet system.

The rapid growth of the executive power in the twentieth century caused some writers to characterize the American system as a presidential government. Yet a number of constitutional and political factors continue to maintain the balance between the executive and legislative powers. See AMERICAN PRESIDENT; CONGRESS OF THE UNITED STATES; GOVERNMENT.

CONGRESSIONAL MEDAL OF HONOR, the highest military decoration in the United States. It is awarded by the president in the name of the Congress to any person who, while an officer or enlisted man in the military, naval, or air forces, in action involving actual conflict with the enemy, distinguishes himself conspicuously by gallantry and intrepidity at the risk of life above and beyond the call of duty. Congress voted a gold medal to George Washington for the evacuation of Boston in 1775, and to others for services in the Revolution, but the Medal of Honor dates from the Civil War. Acts of Congress authorized the medal for naval personnel Dec. 21, 1861, and for the army, July 12, 1862. The first army awards were made Mar. 25, 1863.



U.S. ARMY

From bottom to top are the Medal of Honor for formal occasions, the uniform ribbon, and lapel rosette.

The design of the medals has been changed several times. The medal is a bronze, five-pointed star on a light blue ribbon covered with white stars. The ribbon representing the medal is also light blue with white stars. Army and navy medals vary in some respects.

From 1862 through World War II, 2116 army medals of honor were awarded, and 916 to the navy, marines, and coast guard. These included some awards for peacetime heroism, special medals voted by the Congress, and those awarded the unknown soldiers of the United States and five allied nations in World War I. Awards of the army and navy medals during the Civil War numbered 1527. In World War I, 123 medals of honor were awarded, and in World War II, 429. For heroism in the Korean War more than 125 medals of honor were awarded, many of them posthumously. See DECORATIONS AND MEDALS, MILITARY.

CONGRESS OF INDUSTRIAL ORGANIZATIONS. See AMERICAN FEDERATION OF LABOR–CONGRESS OF INDUSTRIAL ORGANIZATIONS.

CONGRESS OF THE UNITED STATES is the national legislature. The first article of the Constitution sets forth the functions and powers of Congress and the qualifications of its members. Congress is bicameral, that is, it is composed of two chambers. The upper house, the Senate, is composed of two members from each state elected for six years. Originally chosen by the state legislatures, the members, who must be 30 years of age, American citizens for at least nine years, and residents of the state which they represent, are now chosen by direct popular vote (17th Amendment).

The Senate is so organized that the terms of one third of the senators expire every second year. The terms of both senators from a state never expire at the same time. The vice-president of the United States presides over the Senate but has no vote except in the case of a tie. In his absence the president pro tem of the Senate, chosen by the members, presides. Legislation is prepared for the Senate by 15 standing committees. The ratio each party has in the Senate determines its representation on each committee. The chairman is always of the majority party and is usually the senior member. The Senate, in addition to its legislative duties, approves all presidential appointments, ratifies treaties by a two-thirds vote, and tries all impeachment charges brought by the House of Representatives against federal executive and judical officers.

The House of Representatives is composed of a varying number of members, apportioned among the states on the basis of population. By 1956 the membership of the House had reached 435. The term of office is two years. A representative must be 25 years of age, seven years a citizen of the United States, and a resident of the state of which he is a representative. In practice, he must be a resident of the district he represents, although neither the Constitution nor any law requires this. The voters qualified to elect members to the lower house of their state legislature are qualified to vote for federal representatives. Each state determines how its representatives are to be chosen. Some states provide that all their representatives are to be elected at large, that is, on a statewide vote. But most states are divided by their legislatures into districts equal in number to the representation they have in the state's lower house. Because of the change in representation allowed a state, owing to fluctuations in population as shown by the 10-year census, many states choose most of their representatives by districts, but elect one or two at large.

The Speaker of the House, elected by the members, presides. Chosen by a party vote, he is always of the majority party. The representative chosen in caucus by the minority party usually becomes the floor leader of the opposition. Other party officers, known as "whips," are chosen by their parties to assist the floor leader. The 19 standing committees are chosen as they are in the Senate.

House Procedure. The Committee on Rules determines the legislation to be brought before the House, the order of business, and the amount of debate. The complicated procedure necessary to bring a bill before the House without the approval of this committee makes such action rare. Thus this committee dominates legislation.

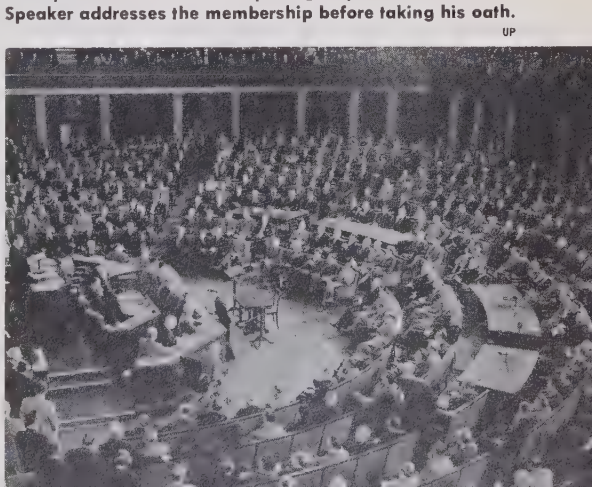
All money bills must originate in the House of Representatives, although the Senate may introduce new material in amendments. Other bills may originate in either house. Both houses must approve a bill in identical form before it is sent to the president for approval or veto. If the two houses disagree on amendments, a conference committee composed of senators and representatives is created, and it attempts to effect compromises mutually agreeable.

Each house determines the rules of its proceedings. In the Senate, debate is unlimited except when two-thirds of the senators vote for cloture, in which case each senator is limited to one hour. Cloture is seldom invoked. Debate in the lower house is limited. Filibustering is thus possible in the upper house but not in the lower. Each house also determines the validity of the qualifications and elections of its members, and can thus refuse to seat contested or improperly elected persons.

The framers of the Constitution expected the lower house to be the more important, but the six-year

Floor and galleries are crowded in this view of the House of Representatives on the opening day of Congress. The Speaker addresses the membership before taking his oath.

UP



term plus normal re-election (20 to 30 years of service is not rare), the opportunity for relatively unlimited debate, the influence in foreign affairs as a result of the treaty provisions, and the participation in spoils growing out of the power to confirm or reject appointments, have made the Senate the more powerful and influential of the two houses. Political scientists formerly credited the method of election for this prestige, but direct election since 1913 has not changed the trend. FRANK L. ESTERQUEST

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CONGREVE, WILLIAM, 1670–1729, English playwright, born in Bardsey, near Leeds. Although of old, well established family, young Congreve spent a great part of his youth in Ireland, where his father commanded a garrison at Youghal and was later an agent for the estates of the earl of Cork. Congreve attended school at Kilkenny and in 1685 entered Trinity College, Dublin, where he formed an enduring friendship with Jonathan Swift. Returning to England, Congreve entered London's Middle Temple, but soon deserted law studies for literature. In 1691 his novel *Incognita, or Love and Duty Reconciled*, written during his stay in Dublin, was published pseudonymously as "Cleophil" in London. This was followed in 1692 by his first comedy, *The Old Bachelor*. A commercial success, it was highly praised by John Dryden, who proclaimed Congreve to be the equal of Shakespeare. *The Double Dealer* (1693), which followed, had a somewhat scandalous celebrity; *Love for Love* (1695) was such a brilliant success that Congreve was given a share in the new theater at Lincoln's Inn Fields with the understanding that he was to produce a new play each year. *The Mourning Bride* (1697), a tragedy, added to his fame, but it was in this year that he was attacked in Jeremy Collier's pamphlet, *View of the Immorality and Profaneness of the English Stage*. Congreve replied with a pamphlet of his own—*Amendments of Mr. Collier's False and Imperfect Citations* (1698). Although Collier's critical principles, however well intentioned, were palpably unsound, the public seemed to feel that he had the best of the argument. However much posterity might disagree with this judgment, Collier's attack was undeniably a telling blow to Congreve's reputation. The presentation of Congreve's greatest work, *The Way of the World* (1700), provoked such public outrage that at the age of 30 the playwright abandoned the theatrical profession and thenceforth largely confined his literary endeavors to composing frivolous verse.

Congreve settled down to the easy existence which a government pension made possible. In 1695 he had been made commissioner for licensing hackney coaches, a post he retained until 1705, when he became commissioner of wine licenses, a position he held until he was named Secretary for Jamaica in 1714. Yet he did not completely lose touch with the theatrical world. In 1705 the playwright Sir John Vanbrugh built a new theater for Congreve's old company, and Congreve helped him manage it for a time, but did little in the way of writing. However, he did write the libretto of the opera *Semele*, for which Handel composed the music, and helped translate Molière's *M. de Pourceaugnac*. Congreve is also remembered for his "Discourse on the Pindaric Ode," a valuable piece of literary criticism accompanying his own *Pindaric Ode to the Queen*. In 1710 he published the first collected edition of his works. He was still universally admired and he could number among his friends most of the more brilliant personalities of his time—Jonathan Swift, Alexander Pope, Sir Richard Steele, the actress Mrs. Bracegirdle, and the second duchess of Marlborough. During his later years Congreve was in poor health and nearly blind—owing, perhaps, to the self-indulgent life he led. He died of internal injuries stemming from a carriage accident.

Writing during the reign of William III when the influence (upon both society and literature) of the Restoration was gradually being tempered by the petty, moralistic tastes of the middle class, Congreve, who was of a distinctly superior artistic temperament, effectively reharmonized in his work all the familiar elements of Restoration comedy. His plays had a purity of matter and a delicacy of form unknown to the Restoration—a fact not recognized by his contemporary critics. All of his early plays, however interesting individually, culminated in the great "failure," *The Way of the World*—a masterpiece of English comedy worthy of comparison with the best of Molière. Despite its carefully contrived plot, its true-to-life characters, and its elegantly exact use of language, this brutally cynical play shocked an audience which could not countenance Congreve's lordly indifference to "orthodox" rules of conduct. RACHEL GILBREATH

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CONIC SECTION is a curve obtained by cutting a right circular cone with a plane. If the cutting plane passes through the vertex V (see Fig. 1) at right angles to the axis O, a point is obtained. If the plane passes through the axis O, the section will be one or two straight lines. These types of conic sections are called degenerates. In the nondegenerate case the conic section is called a parabola, P (see PARABOLA), if the intersecting plane is parallel to one of the elements (surface) of the cone. This curve is open at one end and extends to infinity. If the plane cuts the cone in only a single section, but through every element, the curve is called an ellipse, E (see ELLIPSE), provided the plane is not parallel to the base. Where the plane is parallel to the base, the curve is a circle, C (see CIRCLE). When the plane cuts both nappes of the cone in two sections, the resulting pair of curves are called hyperbolas, H and H' (see HYPERBOLA).

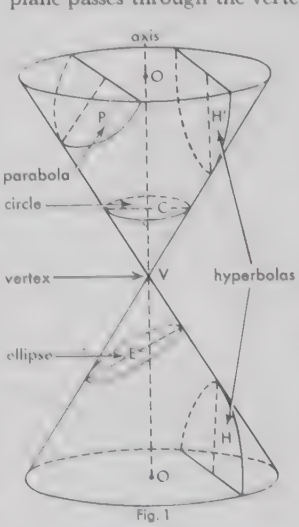


Fig. 1

The mathematical expressions for describing the curves of these conic sections are $x^2 + y^2 = r^2$ for a circle; $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ for an ellipse; $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ for a hyperbola; and $y^2 = 2px$ for a parabola. The values a and b determine the length of the semi-major and semi-minor axis of the curve, or more generally, the size of the curve. The value $2p$ is the length of the latus rectum, a line passing through the focus parallel to the directrix, DD' (see Fig. 2).

Eccentricity, that is, the amount of deviation from a perfect circle, is a geometrical property of conic sections. It is expressed as a ratio of the distance from any point on a conic section to the focus, for example FP (see Fig. 2), and the corresponding distance to the directrix, PL, or $e = FP/PL$. When the ratio e is less than one, the section is an ellipse. If the ratio e becomes zero, the section, no longer eccentric, would be a circle. When the ratio is equal to one the section

is a parabola; a hyperbola has an eccentricity which is one. An equation having two unknowns, x and y, raised to their second power, is called a second degree equation (see EQUATION) and can be represented by a conic section.

Application. Conic sections began to be studied intensively about the time it was discovered that planets move around the sun in practically elliptic orbits with the sun at one focus. It was also found that bodies might move about the sun with orbits which closely approximated the other types of conic sections as well. Comets having hyperbolic or parabolic orbits approach the sun once and depart, never to return. However, it is sometimes difficult to tell whether a comet is moving in a parabolic orbit or a very long elliptic orbit that will bring it back to the original point hundreds or thousands of years later. See COMET.

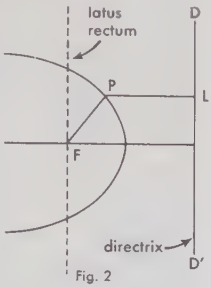


Fig. 2

The conic sections have important characteristics in the reflection of sound and light waves. Thus a two-dimensional light or sound source at one focus of an ellipse will reflect toward the other focus. A source of light or sound at one focus of a hyperbola will reflect away from the other focus, and a source at the focus of a parabola will reflect in straight lines perpendicular to the directrix of the parabola. The Mormon Tabernacle in Salt Lake City, Utah, takes advantage of this characteristic of the ellipse to develop its remarkable acoustics, and this principle is also used to design reflectors when intense illumination is needed in a small space, as in microsurgery. The reflecting property of the parabola is used in searchlights, radar antennas, automobile headlight reflectors, and reflecting telescopes. One of the focal arrangements for the 200-inch telescope at the Hale Observatory on Mount Palomar involves a hyberbolic mirror.

EDMUND PINNEY

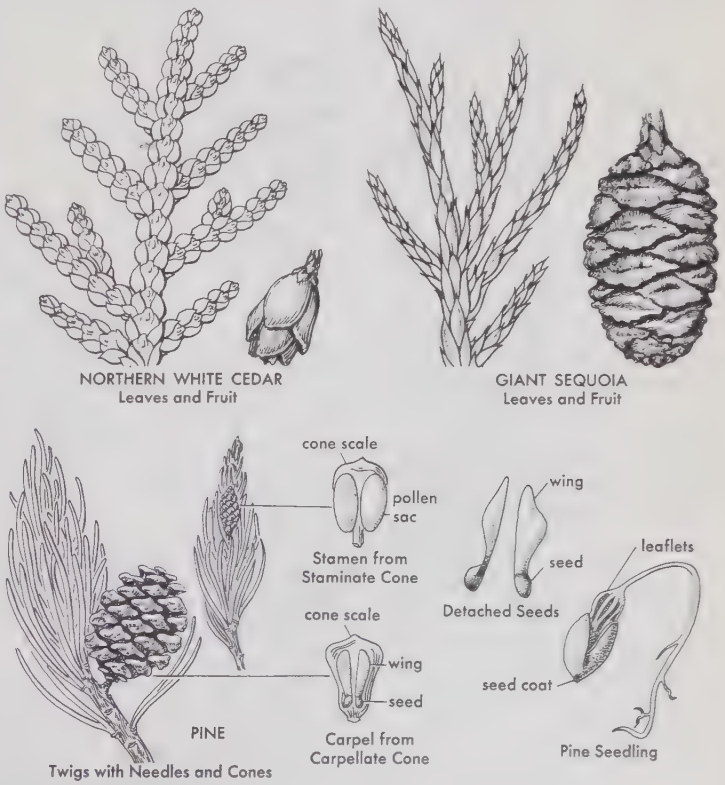
CONIFERS, or evergreens, or softwoods, are mainly evergreen trees and shrubs comprising the largest order of gymnosperms (see BOTANY, *Spermatophyta*). More than 40 genera and 500 species of conifers have been identified. Found predominantly in the Northern Hemisphere, conifers, *Coniferae*, form vast forests often up to timberline. Many conifers are tall trees with straight boles and numerous lateral branches. The trunks consist largely of secondary wood with prominent annual rings and well developed bark (see ANNUAL RINGS; BARK). Coniferous wood, unlike that of broad-leaved trees or angiospermous wood, lacks vessels but is made up largely of tracheids, or specialized cells for conducting water. It often has single rows of large bordered pits, and is permeated by resin canals. With few exceptions, such as the larch and bald cypress, conifer leaves are evergreen, needle-like, scalelike, or awl-shaped. They are borne singly or in fascicles on short spur shoots. The unisexual flowers are aggregated in cones, or strobili, and are either staminate (containing male cells) or pistillate (containing female cells). The pistils often ripen into characteristic woody cones. Conifers may be either monoecious or dioecious. The life history, especially that of some pines, extends over two years, as pollination and fertilization may be separated by long intervals of time. A pollen tube transmits the nonmotile sperms. The seedlings may bear two or many cotyledons (see COTYLEDON).

Conifers are among the most useful plants. They are important forest trees, providing timber, pulpwood, and naval stores (rosin and terpentine). They are widely used in conservation work, particularly in the control of soil erosion. Many species, represented by numerous horticultural forms, are popular ornamentals both indoors and outdoors.

Classification. Living conifers are divided into six families. *Pinaceae* is the largest family with nine genera and more than 200 species. The leaves of these species are spirally arranged and needlelike; the pollen is winged. Found mostly in the Northern Hemisphere, pines extend south to Java, Borneo, the Philippines, and Honduras. Important genera are pine, *Pinus;* spruce, *Picea;* fir, *Abies;* larch, *Larix;* and Douglas fir, *Pseudotsuga*. The *Pseudotsuga* furnish the bulk of timber crop from softwoods.

Taxodiaceae includes eight genera and 15 species whose needle-like, scalelike, or sickle-shaped leaves are spirally arranged except in the dawn redwood, *Metasequoia*. The largest and oldest trees in the world belong to this family, namely redwood, *Sequoia;* big tree, *Sequoiadendron;* dawn redwood, *Metasequoia;* bald cypress, *Taxodium;* Japanese cedar, *Cryptomeria;* and umbrella pine, *Sciadopitys*.

Cupressaceae is a family composed of 15 genera and about 130 species. They are found in both hemispheres and are either trees or low, branched shrubs whose needle-like or scalelike leaves are opposite or whorled. The cones are fleshy. Important genera are



Typical Members of the Order of Conifers

cypress, *Cupressus;* arbor vitae, *Thuja;* white cedar, *Libocedrus;* and juniper, *Juniperus.*

Podocarpaceae, the family with the two genera *Podocarpus* and *Dacrydium*, includes about 100 species of trees or shrubs, found mostly in the Southern Hemisphere. The leaves are usually spirally arranged, needle-like or scalelike in appearance.

Cephalotaxaceae is a small family of trees or shrubs having one genus, *Cephalotaxus*. Plants of this family are found in the Himalaya region and eastward.

Araucariaceae is the family of large conifers of the Southern Hemisphere and is usually divided into two genera, *Agathis* and *Araucaria*. Their leaves are often broad and spirally arranged. The Kauri pine, *Agathis*, yields the subterranean, semifossil resin called kauri, used in varnishes. Bunya-Bunya, monkey puzzle tree, and Norfolk pine are members of *Araucaria*.

Conifers have a long fossil record. Four families have been erected to receive the many fossil woods, cones, and leaves known from late Paleozoic and Mesozoic eras. Fossil members of the six families are known from various Mesozoic eras and Tertiary periods. See GEOLOGIC TIME. THEODOR JUST

CONIINE or **CONEINE,** an oily, poisonous liquid obtained from the hemlock plant, *Conium maculatum*, where it is most abundant in the immature fruit. Coniine is a volatile alkaloid, $C_8H_{17}N$. Poison hemlock is associated in history with the death of Socrates. It will produce death in a few minutes through paralysis of the motor nerves and respiratory failure. At one time this drug was used for treatment of chorea and mania, but because of its uncertain action, it has been replaced by other drugs. See HEMLOCK; ALKALOIDS.

CONISTON, town, Canada, in the province of Ontario, on the Wanopitei River; 7 miles E of Sudbury, 200 miles NNW of Toronto. Industries include nickel mining and smelting, and copper mining. Coniston is the site of a hydroelectric station. Pop. (1951) 2292.

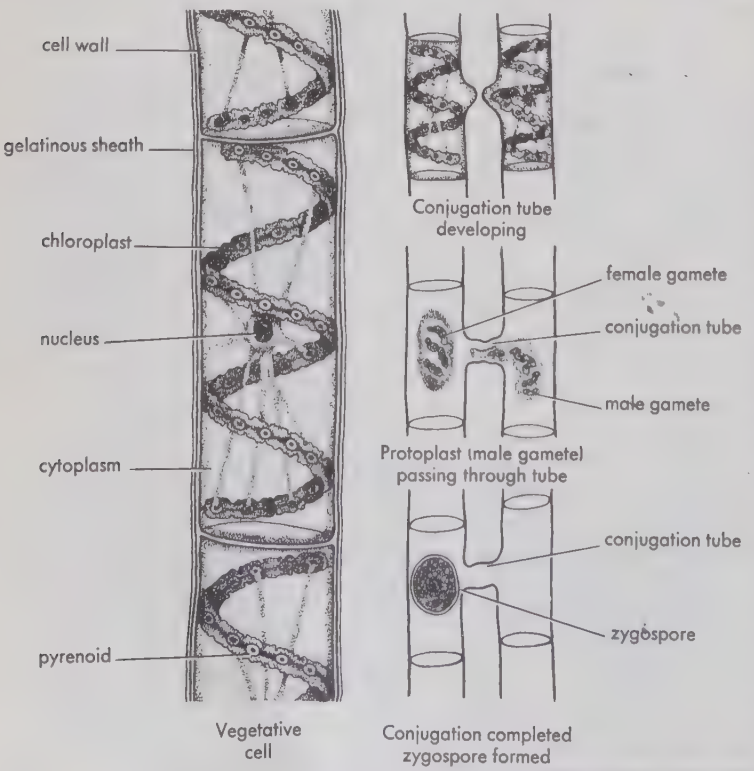
CONISTON WATER. See LAKE DISTRICT.

CONIUM. See HEMLOCK.

CONJEEVERAM or **CONJEVARAM,** also Kanchipuram, city, S India, in the state of Madras, capital of the district of Chingleput, on the Palar River, 40 miles WSW of Madras. Conjeeveram is an important religious center and is held sacred by the Hindus. It is sometimes called the Benares of the South. The city contains numerous temples of great architectural interest and artistic merit, some dating back to the fifth century A.D. and representing nearly all Dravidian styles of architecture. Many important archaeological discoveries have been made in the Conjeeveram area and there are historical records more than 2000 years old in the city. Conjeeveram is visited by great numbers of pilgrims and is a Buddhist educational center of great antiquity. It has long been a place of importance and early in the Christian Era was the capital of the Pallava kingdom. The city later passed into Moslem control and was captured by Lord Robert Clive in 1752. Conjeeveram is noted for the manufacture of silk and cotton textiles. Other industries, mainly of the handicraft type, include the making of pottery, basketry, and wood products. Pop. (1951) 84,810.

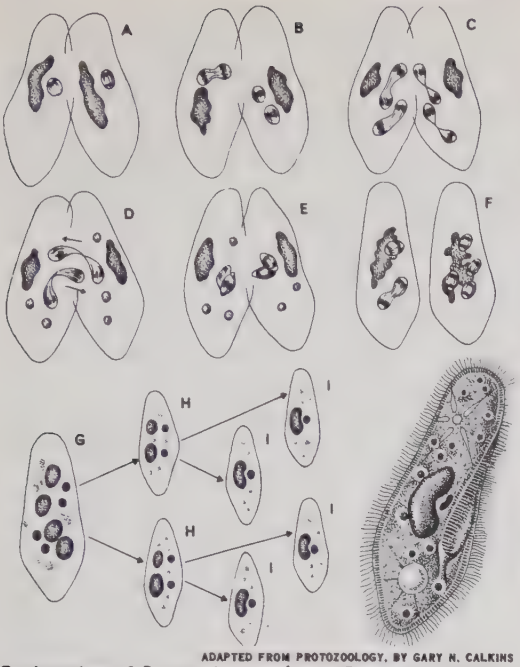
CONJUGAL RIGHTS. See HUSBAND AND WIFE.

CONJUGATION is a method of reproduction involving simple temporary union of two individuals of the same species to accomplish an exchange of part of their nuclear material. Conjugation in plants is evidenced by a group of green algae known as *Zygnematales*, particularly by plants of the genus *Spirogyra*. Two threads of cells of these filamentous plants lie close together and a swelling develops from each cell as if a branch were to be formed. When the ends of these outgrowths meet the end walls are dissolved, resulting in a hollow tube that connects two cells from adjoining filaments. Sometimes many of these tubes are formed at one time between adjoining plants, giving a ladder-like appearance to the plant. This type of arrangement is known as scalariform conjugation. Tubes may also be formed between adjacent cells of the same thread and this type of formation is known as lateral conjugation. When the tubes have been formed, the male cell protoplast contracts and moves through the conjugation tube to join the female cell protoplast. (See PLANT TISSUES AND ORGANS, Tissues, *Embryonic or Meristematic Tissues.*) The union of these cells results in a zygospore. In some plants related to the *Spirogyra*, the cells meet within the tube to form a zygospore. There are many variations of the conjugation process in the families of simple plants. See DESMID; REPRODUCTION IN PLANTS.



Conjugation, the Simplest Form of Sexual Reproduction

Conjugation occurs in animals also. In *Paramecium caudatum*, two individuals come into contact and are held together at their oral surfaces while a bridge of protoplasm forms between them. (See PROTOPLASM.) A series of nuclear changes then takes place in each individual. The macronucleus breaks up and disappears, but the micronucleus of each individual divides until four micronuclei are formed in each animal. Three of each set of four of



ADAPTED FROM PROTOZOOLOGY, BY GARY N. CALKINS

Conjugation of *Paramecium caudatum*. Contact is made at *A*. *B* and *C* show the division of the micronucleus of each into four micronuclei, three of which later degenerate. The remaining micronuclei further divide into a *wandering* micronucleus and a *stationary* micronucleus. The *wandering* micronucleus crosses the protoplasmic bridge, *D*, and fuses with the *stationary* micronucleus to form a synkaryon, *E*. The individuals then separate, *F*, the synkaryon dividing three times to form an individual with four micronuclei and four macronuclei, *G*. The separated individuals divide by fission until four small animals are formed, *I*, each with one micronucleus and one macronucleus. The unlabeled figure depicts an enlarged view of an individual.

these bodies degenerate and take no active part in further changes. The remaining micronucleus in each individual divides again to produce a wandering micronucleus and a stationary micronucleus. Each wandering micronucleus then crosses the protoplasmic bridge and fuses with the stationary micronucleus in the other individual to form a synkaryon. The individual animals now separate and the newly formed synkaryon in each divides three times in succession to form eight nuclei—four micronuclei and four macronuclei. Each of the separated animals continues to divide by fission, first to form two individuals with four nuclei and again to form four new small animals, each with a macronucleus and a micronucleus. See PARAMECIUM; REPRODUCTION IN ANIMALS.

CONJUGATION, in grammar, is the systematic arrangement of changes in verb forms in order to show voice, tense, person, number, and mood. The usual arrangement of the verb *to see*, for example, is as follows:

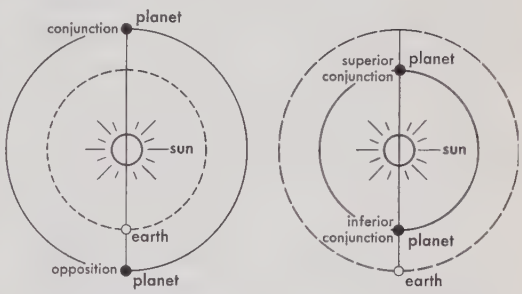
Indicative Mood

ACTIVE VOICE		PASSIVE VOICE	
Present Tense	**Past Tense**	**Present Tense**	**Past Tense**
	SINGULAR		
I see	I saw	I am seen	I was seen
you see	you saw	you are seen	you were seen
he sees	he saw	he is seen	he was seen
	PLURAL		
we see	we saw	we are seen	we were seen
you see	you saw	you are seen	you were seen
they see	they saw	they are seen	they were seen

Person and number are indicated by the pronoun preceding the verb; voice is indicated through use of the auxiliary verbs *am*, *are*, *was*, *were*, and so on. Mood is an indication of the manner in which the action of the verb is conceived by the mind. The three moods of English verbs are: indicative, or mood of fact, as in "I see"; subjunctive, or mood of condition, as in "could I but see"; and imperative, or mood of command, as in "see that!" Verbs that follow a fixed, complete pattern of inflection are called regular verbs; those that deviate from the pattern, irregular verbs; and those that are incomplete in inflection, defective verbs.

CONJUNCTION, the passing of two or more heavenly bodies that have the same celestial longitude, that is, the same angular distance east of the vernal equinox, measured along the ecliptic. (See ECLIPTIC; EQUINOX; CO-ORDINATES, CELESTIAL.) Thus when two planets are in conjunction they are relatively close together in the sky. At new moon, for example, the moon is said to be in conjunction with the sun; then the earth, the moon, and the sun are approximately in line (see PHASE). When the new moon and the sun are exactly in line with the earth, an eclipse of the sun occurs (see ECLIPSE). If the two heavenly bodies in conjunction are very different in apparent size and also have the same celestial latitude (angular distance north or south of the ecliptic), a special kind of eclipse occurs, either an occultation or a transit (see OCCULTATION; TRANSIT).

A planet that revolves inside the earth's orbit is said to be in inferior conjunction when it passes between the earth and the sun, with the alignment of the bodies being earth, planet, sun. It is in superior conjunction when it passes behind the sun and the alignment is earth, sun, planet. (See PHASE, *Phases of Planets*.) A planet that revolves outside the earth's orbit can be in superior conjunction with the sun but not in inferior conjunction with it. If the celestial longitude of such a planet differs from that of the sun by 180° (alignment being sun, earth, planet), the planet is said to be in opposition. The moon also is said to be in opposition when it is in the "full "phase. Heavenly bodies are in conjunction in right ascension when they are at the same angular distance east of the vernal equinox, measured along the celestial equator. See RIGHT ASCENSION; EQUATOR.



Left: the appearance of planets in conjunction with and in opposition to the sun; and right: the planets' position when at superior and inferior conjunction with the sun.

CONJUNCTION, in grammar, the part of speech which is used to join words or clauses. Co-ordinating conjunctions join words or clauses of equal weight, as in "a red dress *and* a white jacket"; a boy *or* a girl"; "all *but* one." Subordinating conjunctions render one clause subordinate to another, as in "he can run faster *than* I." Correlative conjunctions join words or clauses which have a reciprocal relation, as in "I'll go *whether* it rains *or* not"; "*neither* red *nor* blue seems suitable." Two clauses joined by a co-ordinating conjunction form a compound sentence; two clauses joined by a subordinating conjunction form a complex sentence.

CONJUNCTIVITIS is any inflammation of the thin layer of mucous membrane that covers the anterior portion of the eyeball and lines the eyelids. Inflammations of the membranous covering, called the conjunctiva, may result from irritation caused by foreign material or smoke, or may result from infections caused by such diseases as trachoma (see TRACHOMA). Symptoms vary according to the kind and severity of the inflammation, ranging from a slight burning and gritty feeling under the lids to severe pain accompanied by fever and a discharge of pus.

Simple catarrhal conjunctivitis occurs in both children and adults. It is often the result of exposure to wind, dust, smoke, and intense light. It sometimes follows or accompanies infections elsewhere in the body, such as measles, the common cold, or hay fever, and usually subsides within a week or two.

Acute epidemic conjunctivitis is the extremely contagious type often referred to as pinkeye. The pneumococcus (see PNEUMONIA, *Cause*) and Koch-Weeks bacillus, an organism often associated with influenza, seem to provoke this disease. Severe symptoms such as marked redness and swelling of the eyelids and profuse discharge often occur. Pinkeye is prevalent in both adults and children, particularly in the spring and autumn.

Purulent conjunctivitis occurs in two forms: ophthalmia neonatorum, or conjunctivitis of the newborn, and purulent conjunctivitis of adults. Both forms are usually caused by the gonococcus (see GONORRHEA), although occasionally such agents as the pneumococcus and streptococcus (see STREPTOCOCCUS) may be the cause. Purulent conjunctivitis is most dangerous because it is frequently complicated by an ulceration of the cornea that might result in serious damage to the eye and even loss of sight (see CORNEA). Prevention is most important. Antiseptic treatment of the eyes of the new-born infant to prevent ophthalmia neonatorum is compulsory in most states. Extreme cleanliness and precaution to prevent spreading of the disease in adults is imperative.

Principles of treatment for all types of conjunctivitis are essentially the same. The eyes are bathed with a soothing lotion or by means of eye drops, and sulfonamides are either put directly into the eyes or taken by mouth (see SULFA DRUGS). All equipment must be kept scrupulously clean. Pads and bandages to cover the eye are not often used because they hinder a free flow of the discharge. To prevent sticking, the eyelids are greased and lashes kept clean. Fundamentally, treatment attempts to limit the disease so that it will not spread to other individuals and there will be no greater involvement of the affected eye.

CONJURING is the art of producing apparently supernatural effects through natural means which are kept hidden from the spectator. The conjurer achieves his mystifying effects by fooling not the eye but the mind of the audience. The act of diverting the audience's attention, through ritual, patter, or other hocus-pocus is called "misdirection."

The history of conjuring as entertainment is a long one. Apart from the temple magic of the pagan priests of ancient Greece, Egypt, and Rome, who used optical illusions to bring forth divinities and tubes to convey the human voices of their hidden "oracles," the forerunners of the modern magician were secular performers, not priests. An ancient Greek word *psephokaiktes*, meaning "he who deals with pebbles," describes the original "sleight-of-hand" artists who invented the ancestor of the old "walnut shell game." The essential elements of this game—three inverted cups and a single ball which mysteriously multiplied or appeared under a different cup at the prestidigitator's will—were the same in antiquity as in modern times. Under Christianity magic was generally suppressed, and it was not until the middle of the eighteenth century that conjuring was effectively divorced from its association with sorcery and evil spirits. The increasing use of playing cards, along about the twelfth century, opened a new vista to the exponents of sleight-of-hand; by the seventeenth century, the art of "card tricks" was in high popular favor. Performers began to adopt gentlemen's attire, discarding the workingman's apron which had been the traditional costume up to that time. Many magicians used both card tricks and the more traditional effects of legerdemain, for there was an ever-present need for "new effects."

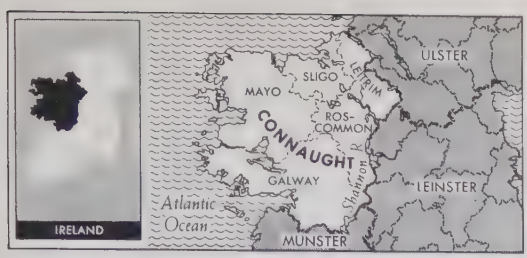
The father of modern conjuring was the Frenchman Robert Houdin (1805–71), who achieved such fame that the French government dispatched him as a special envoy to Algeria with the mission of dissuading the natives from their belief in the magic of Marabout priests. In America, public performances of magic were given long before the Revolution. Great American conjurers of a later day included Harry Kellar, Howard Thurston, Blackstone, and the immortal Harry Houdini, who specialized in fantastic "escapes," but was nevertheless the most proficient living performer of all types of magical effects. Like his self-proclaimed "heir," Dunninger, Houdini made a hobby of exposing fraudulent "spirit mediums." Twentieth century magicians were a well-organized fraternity, knowing no nationalistic boundaries and holding to a strong ethical taboo against revealing to the public the secrets of their own acts or those of fellow conjurers. They tended to specialize in one type of effect or another, and often spent enormous amounts of time and money to perfect a single act. The floating girl act of Harry Kellar was said to have cost $50,000 to develop. THOMAS L. ROWE

CONKLING, ROSCOE, 1829–88, U.S. political leader, was born in Albany, N.Y. He studied law in Utica, was district attorney at Albany, and mayor of Utica. In 1858 he was elected to Congress as a Republican, remaining in the House of Representatives until 1867, with the exception of one term, 1863–65. He was a formidable debater, a brilliant orator, and a bitter opponent of James G. Blaine. During the Civil War Conkling supported President Abraham Lincoln, but after the war opposed President Andrew Johnson's Reconstruction policy and often sided with the "radical" Republicans.

Entering the U.S. Senate in 1867, Conkling built a political organization that flourished on patronage for more than 10 years and made him the dominant political figure in New York state. In 1876 he was a candidate for the Republican nomination for president, opposed to Blaine, but Rutherford B. Hayes was nominated. By 1877, when Hayes became president, Conkling was leader of the "Stalwart" faction of the party, and opposed Hayes, who was supported by the "Half Breeds." In 1880 Conkling supported President U. S. Grant for a third term, but James A. Garfield was nominated and elected. Garfield appointed Blaine secretary of state and made appointments in New York state without consulting Conkling who, with Senator T. C. Platt of New York, unsuccessfully opposed confirmation of the appointees. In May 1881 Conkling and Platt resigned from the Senate. Retiring from politics, Conkling practiced law in New York City. See BLAINE, JAMES GILLESPIE; HALF BREEDS AND STALWARTS.

CONNAUGHT, ARTHUR WILLIAM PATRICK ALBERT, DUKE OF, 1850–1942, third son of Queen Victoria, was born in Buckingham Palace. Commissioned in the Royal Engineers in 1868, Connaught served with the British army in Egypt, in India, and in England. Connaught was commander in chief in Ireland, 1900, and in the Mediterranean, 1907–09. He was Canadian governor general, 1911–16.

CONNAUGHT or **CONNACHT,** former province, W Ireland, bounded by the Atlantic Ocean on the W and N, and by the provinces of Ulster on the NE, Leinster on the E, and Munster on the S. The province of Connaught is one of the historic divisions of Ireland. It was a state in pre-Celtic times and during the medieval period formed one of the Irish king-



Location Map of Connaught

doms. Counties Leitrim, Sligo, Mayo, Roscommon, and Galway now compose Connaught. See IRELAND, articles on individual counties.

CONNEAUT, city, NE Ohio, Ashtabula County, at the mouth of Conneaut Creek; on the Nickel Plate, the New York Central, and the Bessemer and Lake Erie railroads; on U.S. highway 20; 2 miles from the Pennsylvania state line and 66 miles NE of Cleveland. Conneaut is an important Lake Erie shipping port for iron ore, coal, and steel because of its natural harbor. There are railroad locomotive and car shops, and commercial fisheries. Shovels, tools, tin cans, and steel and electrical equipment are also produced. The Western Reserve pioneers landed here in 1796 (see WESTERN RESERVE) and settlement was made in 1799 by Thomas Montgomery and Aaron Wright. Pop. (1955) about 11,000.

CONNECTICUT, state, NE United States, in S New England, bounded on the N by Massachusetts, on the E by Rhode Island, on the S by Long Island Sound, and on the W by New York; area 5009 sq. mi., of which 110 sq. mi. are inland water surface; pop. (1950) 2,007,280; it is 48th among the states in area and 28th in population. The state is 95 miles from east to west and 70 miles from north to south. The name Connecticut is probably derived from the Indian word Quinnehtukqut, meaning "beside the long tidal river." Its nickname, "The Constitution State," stems from the fact that it was the first of the 13 original colonies to frame a written constitution, the Fundamental Orders of Connecticut. Connecticut is also called the "Nutmeg State" from the legend that wooden nutmegs were sold by the resourceful Connecticut Yankee peddlers. Its motto is *Qui Transtulit Sustinet* (he who transplanted still sustains). The state flower is the mountain laurel and the official bird is the robin. Connecticut is one of the 13 original states. Hartford is the capital. See map in Atlas, Vol. 20. For state flag in color, see FLAG.

PHYSICAL FACTORS

Geology. Connecticut is situated in the southern extension of the uplifted New England peneplain. The weaker rocks, generally found in the central section of the state, have been worn down by erosion; the more resistant rocks, found in the eastern and western sections, have been reduced slightly. The rocks that underlie and outcrop in the latter sections are primarily complex faulted and folded granite, marble, schist, and slate of Pre-Cambrian age. The central sections consist of underlying rocks of faulted sandstone, conglomerate, and shale of Triassic age which have been worn down by erosion. In the central section are some resistant rocks, called trap ridges, which are found at West Rock ridge near New Haven and the Hanging Halls of Meriden. The topography of the state has been modified by the continental glaciation of the Pleistocene epoch, altering the drainage pattern, relief, and the soil. See GEOLOGY; GLACIAL EPOCH.

Topography. Geographically, Connecticut can be divided into three areas: the eastern and western highlands and the central lowlands. The western highlands consist of rolling mountains, the Litchfield Hills, running in a north-south direction with streams flowing between their forested ridges. In the northwestern corner of the state is Mt. Frissell, 2380 feet, highest point in Connecticut. The central lowlands include the valley area drained by the Connecticut River and the gently sloping coastal plain, with a maximum elevation of less than 500 feet. The eastern highlands consist of low rounded hills under 1000 feet, less rugged than the Litchfield Hills.

Rivers and Lakes. Three rivers of considerable size flow southward across Connecticut. The Housatonic and the Naugatuck rivers drain the western portion of the state; the Connecticut River—New England's largest—the central portion; and the Thames and its tributaries, the Willimantic and the Quinebaug rivers, the eastern portion. The Housatonic, the Connecticut, and the Thames are all navigable for short distances, with barge traffic predominant. The coast line is about 100 miles long and is indented by numerous bays, estuaries, and harbors, that of New London being especially good. Several islands lie offshore; one of the larger is Cockenoe Island. There are more than 1000 lakes, reservoirs, and ponds in the state; Lake Candlewood is the largest.

Climate. Connecticut has a humid continental climate with warm summers. Summer temperatures average 71.5°F, with frequent hot periods of over 100°F. Subzero to zero temperatures accompanied by snow and sleet storms are experienced in winter. The average winter temperature is 26.9°F; temperatures of −30°F have been recorded. Winters are coldest in the northwestern part of the state, the average temperature being 24°F; in the southeast temperatures average 30°F. Precipitation is evenly distributed throughout the year with the annual average being 45.5 inches, and about 55 inches in the Connecticut Valley. The state's climate is modified by its hill and valley topography and the summer cooling and winter warming effect of Long Island Sound. The growing season ranges from 160 days in the north to 180 days in the south. Frosts do not generally occur between the beginning of May and the beginning of October. Destructive winds are uncommon, but hurricanes in the mid-1950s brought torrential rains that caused floods, a heavy toll in lives, and crop and property damage, especially in the Naugatuck Valley.

Soils and Natural Vegetation. In general, Connecticut has gray-brown podzolic soils. In the eastern and the western highlands there are many boulders or erratics deposited by the continental glaciation which are a hindrance to agriculture. In the Connecticut Valley, however, the soil is a productive sandy loam.

The atmosphere of the sea and ships may be enjoyed close at hand in some of southeastern Connecticut's quaint old fishing villages, where fishing boats still put out daily.
CONNECTICUT DEVELOPMENT COMM.

Most of Connecticut lies in the northeastern hardwood forest of beech, birch, chestnut, maple, oak, poplar, and coniferous trees, particularly hemlock and pine.

Animals. Connecticut's most plentiful animals are the white-tailed deer, several kinds of foxes, and cottontail rabbits. Since the state lies in the migratory paths of both shore and water birds, a great variety of birds—warblers, thrushes, sparrows of several kinds, fresh-water ducks, ruffed grouse, and quail—visit it each year. Pheasants have thrived since they were introduced into the state.

Social Factors

Population. The estimated population of Connecticut in 1955, 2,241,000, was an increase of 11 per cent over the 1950 census of 2,007,280. Connecticut in 1950 was the 28th ranking state in population and the fourth in population density. According to the census of 1950, 78 per cent of the people were urban residents, 22 per cent rural. Of the total 1950 population, 1,952,329 persons were white, 53,472 were Negroes, and 1479 were of other races. In 1950 there were living in Connecticut 297,859 foreign-born persons, primarily from Canada, Germany, Great Britain, Italy, Poland, and Russia, or 2.9 per cent of the total foreign-born persons living in the United States. Geographically, most of the people of Connecticut live either in the Connecticut Valley or within a few miles of Long Island Sound.

PRINCIPAL CITIES

	POPULATION 1955 Estimate	1950 Census
Hartford (capital)	187,400	177,397
Bridgeport	166,800	158,709
New Haven	165,600	164,443
Waterbury	111,100	104,477
Stamford	83,100	74,293
New Britain	82,500	73,726
Norwalk	57,900	49,460
West Hartford	53,100	44,402
Meriden	48,400	44,088
Bristol	43,000	35,961

Education. In 1953–54 Connecticut had an enrollment of 365,193 in public elementary and secondary schools, of which 281,678 were in elementary schools, 18,180 in junior high schools, and 65,335 in high schools. In 1952–53 the state expenditure for public schools was $78,170,000. Notable schools of higher education include: Yale University, established in 1701 (see Yale University), and Berkeley Divinity School (formerly at Middletown) at New Haven; Trinity College, Hartford Seminary Foundation, and Hillyer College at Hartford; Connecticut College for women and the U.S. Coast Guard Academy at New London; Wesleyan University at Middletown; the University of Connecticut at Storrs (established in 1881 as Storrs Agricultural School); the University of Bridgeport at Bridgeport; Fairfield University at Fairfield; Quinnipiac College at Hamden; and state teachers colleges at Danbury, New Britain, New Haven, and Willimantic.

Hartford, Connecticut's capital, is a New England leader in manufacturing, while prominence in the insurance field gives it the title of "insurance capital of the nation."

CONNECTICUT DEVELOPMENT COMM.

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Tobacco is the Connecticut Valley's most important crop, having grown there since 1680. It is raised under cheesecloth canopies to protect it from extremes of weather.

Public Welfare. The state charitable institutions include the Mystic Oral School for the Deaf at Mystic, schools for the blind at Hartford and Wethersfield, a home for crippled children, five mental hospitals, five state tuberculosis sanatoriums, and a veterans' home. Penal institutions include a state prison, a reformatory, a school for boys, and a corrective farm and prison for women. The program for the care of the poor and needy is administered by the state department of public welfare.

Economic Factors

Natural Resources. The most important natural resource of Connecticut is its agricultural land, particularly along the Connecticut River. Most extensive mineral resources are stone for roads and other construction. The hydroelectric power resources of Long Island Sound are important. The forests are not primarily important as a source of lumber.

Agriculture. In 1953 there were 15,615 farms in the state, with the Connecticut Valley the major agricultural producing area. Tobacco, its most important crop, has been cultivated in the valley since 1680. Connecticut Valley shade tobacco, grown under cheesecloth canopies to protect it against the sun and extremes of weather, is chiefly used in making fine cigars. Throughout the state are fruit orchards producing apples, peaches, pears, and other fruits; vegetable truck farms producing onions and other vegetables; general farms producing hay, oats, potatoes, and corn; and nursery and greenhouse establishments. Poultry is raised throughout the state, particularly in the eastern section. Dairying is also important, especially in the north.

Fisheries. The state shellfish commission has actively aided commercial interests in developing the cultivation of oysters and lobsters. It has taken such measures as regulating the harvesting of shellfish, fixing closed areas, licensing vessels, eliminating pests, and establishing a lobster hatchery at Noank. With the state health department it has worked to overcome the hazard to the commercial fisheries resulting from streams and harbor pollution. Oyster farming, the harvesting of clams, swordfishing off Stonington and Mystic, offshore flounder fishing, scallop fisheries on the Niantic River, and shad fisheries on the Connecticut River are valuable marine industries. Long

CONNECTICUT

Connecticut, famous for industry, is called the Constitution State, and, popularly, the Nutmeg State.

PRINCIPAL PRODUCTS

- Tobacco
- Fruit
- Vegetables
- Poultry
- Dairying
- General farming
- Seafood
- Manufacturing
- Textiles
- Firearms

Yale University at New Haven has been educating students for the nation and the world since 1701.

Coat of Arms

State Bird
American Robin

State Flower
Mountain Laurel

State Tree
White Oak

State Capitol: Hartford

State Flag

State Seal

Island Sound yields flounder, mackerel, shad, bluefish, and menhaden, and lobster, oysters, and other shellfish.

Mining. While the mineral resources of Connecticut are not extensive, there are quarries of considerable value. In 1952 the value of minerals produced was $7,125,000, including clay products, feldspar, sand and gravel, and stone. The state has considerable resources in granite, limestone, and sandstone. The production of iron around Salisbury became important after 1732, and mines in that vicinity furnished metal for cannon and other military supplies used in the Revolutionary War. A vein of siderite at Mine Hill in Roxbury was prospected at various times, chiefly in the hope of finding silver.

Manufacturing and Commerce. Connecticut is predominantly a manufacturing state, and has the highest percentage of skilled workers among the states. The inventive genius of many of the early settlers and later natives of Connecticut has contributed substantially to the development of American industry. Outstanding was Eli Whitney (see WHITNEY, ELI), who introduced standardized, interchangeable parts (1798) in the manufacture of firearms, thus paving the way for mass production methods. In the history of clockmaking Eli Terry, Seth Thomas, and Chauncey Jerome played major parts. Well known makes of clocks and watches are still produced in Waterbury. Charles Goodyear of New Haven discovered the process for vulcanizing rubber, and thus brought an important industry to the state. John Fitch, a native of Windsor, was among the first men to apply steam power to navigation. The manufacture of sewing machines was first undertaken on a large scale by Elias Howe at Bridgeport; improvements were made by Nathaniel Wheeler and Allen Wilson in the same city. The development of the electro-silver plating industry is credited to the Rogers brothers of Hartford. The city of Meriden leads in the production of silverware and silver-plated ware.

Connecticut has played an important part in the development of the firearms industry (see COLT, SAMUEL) and has been a leader among the states in the production of firearms and ammunition, especially at Hartford, Bridgeport, and New Haven. The state also ranks first nationally in brass and copper products, with the industry centered in the Naugatuck Valley around Waterbury. Hardware is a major industry in New Britain and the surrounding area. Danbury is famed for hats. Important, too, is the production of typewriters at Hartford; textiles, including rayon and nylon at Manchester; cotton at Willimantic; carpets at Thompsonville; machines and machine tools at New Haven, Bridgeport, and Hartford; and airplane parts at Hartford and Stratford. Other industries of Connecticut include steel, rubber products, metal products, foundry and machine shop products, and the manufacture of motor boats, launches, and submarines.

Some of the chief insurance companies of the United States have their home offices in Hartford, the "insurance capital of the world."

Transportation and Communication. Connecticut's excellent transportation system links it to the rest of New England and the nation at large. The main railroad lines are the New York, New Haven and Hartford, and the Central Vermont, a subsidiary of the Canadian National. Transcontinental airlines cross the state, and several federal highways—including U.S. 1—form main arteries of travel connecting with a network of state roads. The state maintains 3012 miles of highway. State Highway 15, which in Connecticut is the Merritt Parkway and its extension the Wilbur Cross Highway, is a low-fare toll road which provides fast transportation between Boston, Hartford, and New York City. Construction of an expressway connecting New Haven with Cape Cod was started in 1955. While land and rail routes have usurped much of the former river traffic, three seaports—Bridgeport, New Haven, and New London—handle both coastwise and overseas traffic.

Tourist Attractions. There are 59 state parks in Connecticut, notable for their scenic views, cascades, fishing, and woodland trails. Sherwood Island, Hammonasset Beach, and Rocky Neck state parks border Long Island Sound and offer pleasant sites for fishing, boating, and bathing. The Appalachian Trail and other well marked hiking and bridle trails cross the state. Along the sound are sunny sea beaches, resorts, and yachting and boat clubs. In the mountain foothills winter sports, especially skiing and bobsledding, are enjoyed.

Connecticut villages have the charm typical of peaceful New England towns. Interesting old houses centered around a village green have been preserved, and the birthplaces and homes of famous residents are well marked. Many towns are distinguished for their contributions to early American history.

ADMINISTRATIVE FACTORS

Government. Connecticut is governed under a constitution adopted in 1953, effective in 1955. Amendments require the support of two-thirds of the elected membership of the General Assembly for proposal, and a majority of the voters present at town meetings for passage. The executive department consists of six elected state officials—the governor, lieutenant governor, secretary of state, treasurer, comptroller, and attorney general, all of whom are elected for four-year terms. The governor has the veto power, but his veto can be overridden by a majority vote of the members of the general assembly. Connecticut does not have primary elections, but each political party holds a convention to nominate candidates for state offices. The general assembly is composed of a house of representatives of 279 members and a senate of 36 members, all of whom serve two-year terms. The representatives are elected by voters in the 169 towns in the state, 110 towns sending two representatives each and 59 sending one each. Senators are elected from 36 senatorial districts, approximately equal in population. Regular legislative sessions are held biennially in the odd years and are limited to five months; special sessions may be called by the governor at any time.

Judiciary and Voting Requirements. The judicial department consists of the Supreme Court of Errors, the Superior Court, and the Court of Common Pleas, whose members are nominated by the governor and appointed by the general assembly. The Supreme Court of Errors, the highest court, is an appellate court and consists of a chief justice and four associate justices appointed for eight-year terms. Probate judges and justices of the peace are elected.

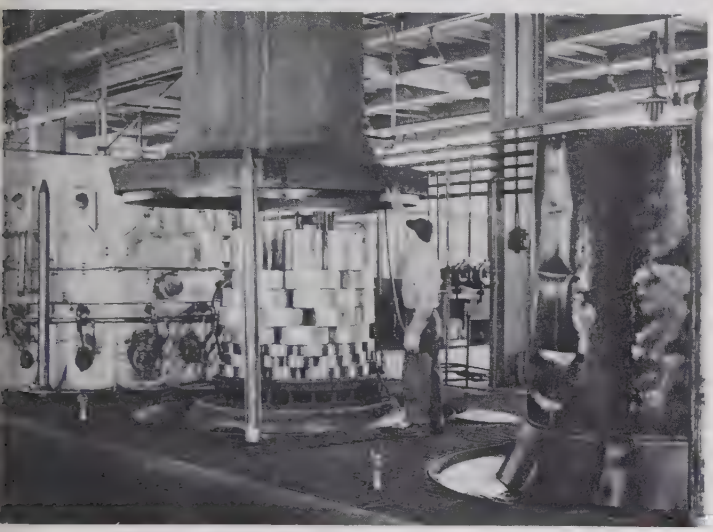
Requirements for voting in Connecticut include U.S. citizenship, a minimum age of 21, a residence of one year in the state including six months in one district, and a literacy test. The state has a permanent registration system. Connecticut has two senators and six representatives in the Congress of the United States.

Local Government. The eight counties in Connecticut are unimportant units of government; their work is primarily concerned with welfare. The towns serve as agents of the state in carrying out the state laws, collect state taxes, conduct state elections, and perform other various functions. The town meeting is the town's legislative body and the center of town government.

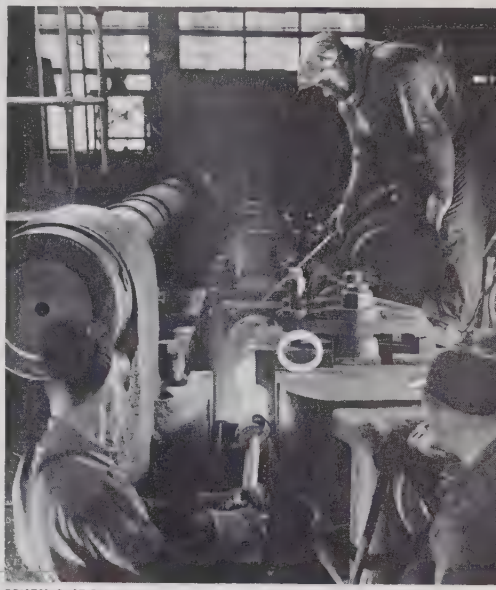
History. The Dutch claim to Connecticut was based on Adriaen Block's exploration of the Connecticut River in 1614. The first white settlement, only temporary, was made by the Dutch at the site of Hartford in 1633. English settlers from Massachusetts founded Windsor later in the same year, Wethersfield in 1634, and Hartford in 1635. In 1635 Saybrook was settled under a dubious grant by the Earl of Warwick to Lord Say and Sele, Lord Brooke, and 11 others. In 1636 a dissatisfied group of Puritan settlers

CONNECTICUT

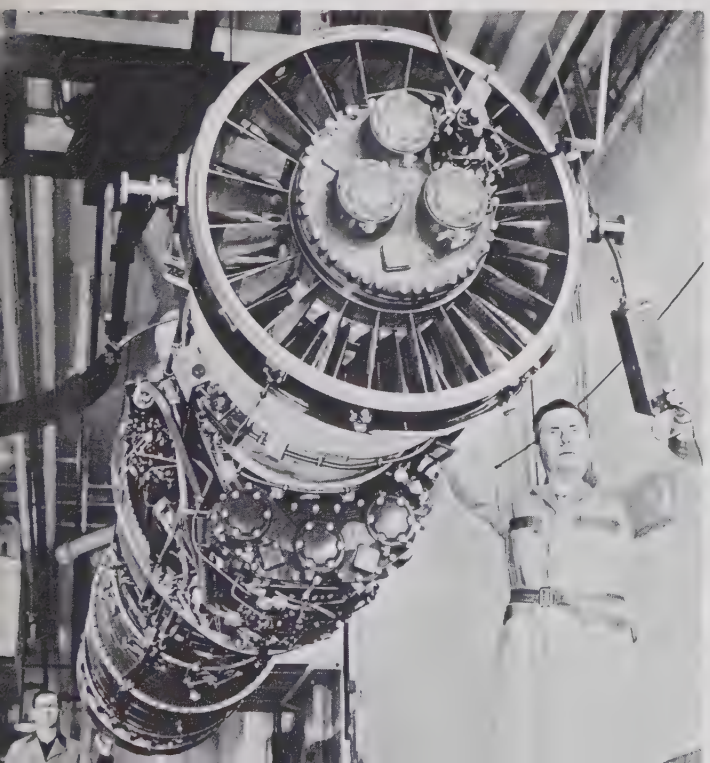
Electric typewriters are adjusted on a Hartford assembly line preparatory to final inspection, packing, and shipment.
CONNECTICUT DEVELOPMENT COMM.



CONNECTICUT DEVELOPMENT COMM.
Consistent high quality of brass sheets and strips is assured by annealing in these modern electric furnaces.



BRISTOL C. OF C.
Ball bearing manufacture is an important industry in Bristol. Shown is the forging of ball races.



A turbojet engine is inspected in an East Hartford plant. The state is an important producer of all types of aircraft engines.
CONNECTICUT DEVELOPMENT COMM.

CONNECTICUT DEVELOPMENT COMM.
High quality standards of finished silver are maintained by careful inspection at a silverware factory in Meriden, Conn.

CONNECTICUT DEVELOPMENT COMM.

In the western part of Connecticut are many homes of New York City commuters, such as this lovely suburban estate in Fairfield County, typical of the homes in this area.

from the Bay Colony were led to Hartford by Thomas Hooker (see HOOKER, THOMAS). The Pequot War was successfully waged by Capt. John Mason and his forces against the Pequot Indians in 1637 (see PEQUOT WAR). In 1639 the Fundamental Orders of Connecticut, the first written constitution in the 13 colonies, was adopted by representatives of Hartford, Windsor, and Wethersfield. New Haven, settled in 1638, was governed independently (see NEW HAVEN). In 1654 the Dutch fort and trading post at Hartford was seized. King Charles II of England in 1662 granted the charter for Connecticut to John Winthrop, Jr., then governor of the colony; the charter included the New Haven settlement under the jurisdiction of Connecticut. In 1687 Sir Edmund Andros, governor general of New England, demanded the surrender of this charter, his purpose being to unify New England into one colony. The colonists refused to produce the charter, according to tradition hiding it in a hollow tree, known later as the "Charter Oak." Andros, however, dissolved the existing government and assumed control until 1689. Through the seventeenth and eighteenth centuries the Connecticut settlements had a reputation as staunchly conservative in manners and politics, and having rigid standards in morals and religion. The "Blue Laws," strictly regulating personal behavior, reflected these attitudes. See BLUE LAWS.

During the Revolutionary War Connecticut contributed many soldiers to the Continental forces, including Israel Putnam and Nathan Hale and such civil leaders as Jonathan Trumbull, Roger Sherman, and Oliver Ellsworth. During the war there was little fighting on Connecticut soil, but the cities of Danbury, Norwalk, Fairfield, New Haven, and New London were attacked by the British, the two latter being almost totally destroyed. In 1776 the colony declared itself a free and independent state, but continued to govern itself under the Charter of 1662. In January 1778 Connecticut became the fifth state to ratify the U.S. Constitution. Connecticut claimed the region from Massachusetts on the north to the "Sea" (Atlantic Ocean) on the south, and from Narragansett Bay on the east to the "South Sea" (Pacific Ocean) on the west by virtue of her royal charter of 1662. In 1782 there was a boundary dispute between Pennsylvania and Connecticut over the Wyoming Valley in Pennsylvania, the result being that Connecticut relinquished its control. At the close of the war Connecticut claimed jurisdiction over part of the region north and west of the Ohio River, but in 1786 ceded the western lands with the exception of the Western Reserve. See WESTERN RESERVE.

The state, strongly Federalist, was not in sympathy with the War of 1812 and was instrumental in calling the Hartford Convention (see HARTFORD CONVENTION). In 1818 the state adopted a new constitution, which definitely separated church and state, widened the voting franchise, and separated legislative, executive and judicial powers. Until about the middle of the nineteenth century the leading occupation of the state was agriculture, although there were numerous small factories. Whaling was an important economic activity in the eighteenth and nineteenth centuries, especially in New London.

With the construction of the railroads, Connecticut changed to a predominantly industrial state. During and after the Civil War the state underwent great industrial expansion. Immigrants began to arrive in large numbers about the middle of the nineteenth century, to fill railroad construction and other jobs. First to come were the Irish, who were followed by many Germans, British, and French Canadians. Italians and Poles were most numerous among the immigrants who settled in Connecticut from nearly every country of Europe in the late 1800s and early 1900s.

During World War I Connecticut was a major producer of armaments and contributed 60,000 men to the armed forces. Connecticut industry suffered in the 1920s and 1930s, not only from the general economic depression but from the movement out of the state of many textile mills. In 1937 the constitution was amended to give the governor increased powers and to improve the civil service system. In March 1936 there were disastrous floods; a hurricane in September 1938 brought immense havoc, especially along the coast.

During World War II the state was a leader in manufacture of munitions and aircraft. The nation's first atomic submarines, the *Nautilus* and the *Seawolf*, were launched at the Groton submarine base in 1954 and 1955. Connecticut industry obtained a comparatively high percentage of federal defense contracts during the post-World War II period, a factor which contributed to the state's general prosperity. Hurricane-borne floods in late 1955, however, represented a major disaster which brought death to about 100 persons, unemployment to 86,000, and $200 million in property damage. A simplified version (adopted 1953) of the constitution of 1818 became effective Jan. 1, 1955. See BOWLES, CHESTER; BROWN, JOHN; DWIGHT, TIMOTHY; ELLSWORTH, OLIVER; HALE, NATHAN; PUTNAM, ISRAEL; SHERMAN, ROGER; TRUMBULL, JONATHAN; WEBSTER, NOAH; WELLES, GIDEON; WINTHROP, JOHN; WOLCOTT, OLIVER.

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CONNECTICUT, TEACHERS COLLEGE OF. See COLLEGES AND UNIVERSITIES.

CONNECTICUT, UNIVERSITY OF, at Storrs, founded in 1881 as an agricultural school, comprises 15 schools and colleges, with undergraduate branches in Hartford, Waterbury, and Stamford. The state university and Connecticut's land-grant institution, the school has been coeducational since 1893. Originally the university was known as Storrs Agricultural School. In 1899 the name was changed to Connecticut Agricultural College, to Connecticut College in 1933, and to its present designation in 1939. The main campus at Storrs consists of the colleges of arts and sciences, and of agriculture; the schools of business administration, education, engineering, physical education, home economics, nursing, pharmacy, and physical therapy; the graduate school; and the Ratcliffe Hicks school of agriculture. The schools of law and social work and the college of insurance are lo-

CONNECTICUT

Highlights of History

Charles D'Wolf Brownell's painting, *The Charter Oak*, shows tree where Connecticut's liberal charter was hidden in 1687.
CONNECTICUT STATE LIBRARY

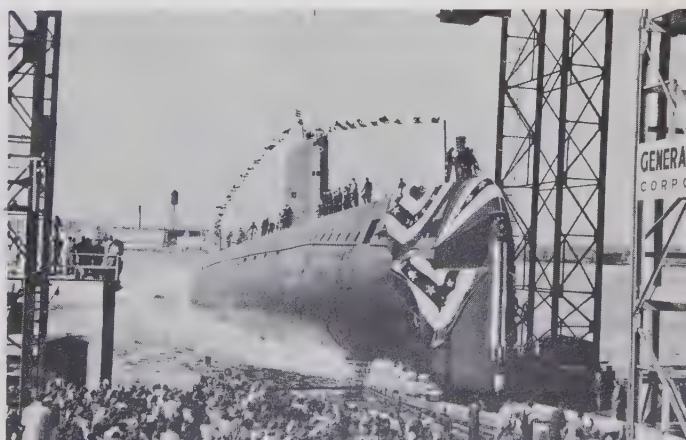
Eli Whitney's early use of quantity production methods in his firearms factory at Hamden spurred later manufacturers to follow his lead.

BETTMAN ARCHIVE

Famous in the annals of the Revolutionary War is the departure of Israel Putnam for military service; this print shows him leaving the plow.

Yale University, famed educational institution, was founded in 1701, by Act of the assembly to erect a "Collegiate School."
EWING GALLOWAY

Connecticut's early days of shipbuilding fame were recalled when the world's first atomic submarine, USS *Nautilus*, was launched in 1954.
UP



UNIVERSITY OF CONNECTICUT

Wilbur Cross Library's gold dome is the University of Connecticut's chief landmark. The school, an agricultural college when founded in 1881, became a university in 1939.

cated at Hartford. Important activities of the university are the public service and labor-management institutes, the continuing education center for adult education, and the reserve officers training program. See COLLEGES AND UNIVERSITIES.

CONNECTICUT COLLEGE. See COLLEGES.

CONNECTICUT LAKES, three lakes in extreme N New Hampshire, Coos County, which are the source of the Connecticut River. The lakes are named in numerical order. There are dams on First and Second Connecticut lakes.

CONNECTICUT RESERVE. See WESTERN RESERVE.

CONNECTICUT RIVER, the largest river of New England, rises in the Connecticut Lakes in Coos County, N.H., near the Canadian border, flows southward for about 360 miles, and empties into Long Island Sound. The river forms the state boundary lines between Vermont and New Hampshire and flows across western Massachusetts and central Connecticut. A number of cities are situated on its banks, including Holyoke and Springfield, Mass., and Hartford and Middletown, Conn. Its principal tributaries are the White River in Vermont, the Ammonoosuc and the Ashuelot rivers in New Hampshire, the Deerfield, the Millers, the Westfield, and the Chicopee rivers in Massachusetts, and the Farmington River in Connecticut. The upper Connecticut Valley has several dams and hydroelectric and flood control developments. The lower valley is a fertile agricultural region which produces specialized crops in Massachusetts and shade-grown tobacco in Massachusetts and Connecticut. The river is navigable by steamer from its mouth to Hartford, a distance of 52 miles. The river yields several species of fish, including rainbow and brown trout and bass.

The Connecticut River, the boundary between Vermont and New Hampshire, passes through some of New England's most scenic countryside. This view is at Bellows Falls, Vt.

USDA

CONNECTIVE TISSUE is the supporting tissue of the body. In the adult it eventually forms connective tissue proper, cartilage, and bone. (See CARTILAGE; SKELETON AND THE DYNAMICS OF BONE.) It also serves as a protective padding and provides a pathway for blood vessels and nerves. Connective tissue in the embryo and in the adult differ in structure and consistency. Embryonic connective tissue is mesenchyme, the first type of embryonic tissue formed, and mucous. Mesenchyme consists of a network of branching cells surrounded by a homogeneous intercellular fluid. As the embryo matures, primitive fibers develop between the cells and the fluid becomes thicker. This tissue then becomes mucous connective tissue. See EMBRYOLOGY.

Tissue Elements. Adult connective tissue is made up of fibers, cells, and ground substance that form loose and dense connective tissue proper. The loose tissue covers, supports, and binds together most of the body structures. It acts as the framework for many organs, surrounds the nerves and blood vessels, and serves as a filler in spaces between structures. Translucent and soft, it often contains fat cells and is then designated as adipose tissue (see ADIPOSE TISSUE).

Fibers in dense connective tissue are arranged in bands and sheets that form such structures as the dermis (see SKIN, *The Dermis;* TENDON; LIGAMENTS). When these fibers are irregularly arranged they form

This areolar connective tissue shows *A*, elastic fiber; *B*, collagenous fiber; *C*, plasma cell; *D*, fibroblast; *E*, mast cell; *F*, lymphocyte; *G*, histiocyte (clasmatocyte).

the coarse, tough matting found in the capsules of body organs and the periosteum, the thin tissue that covers bone. When the fibers are regularly arranged they form cordlike structures and bands. Arranged in parallel fashion, these fibers lie close together to form structures of great tensile strength, such as tendons and ligaments.

Fibers. White, reticular, and elastic fibers make up connective tissue. The white, or collagenous, fibers are bundles of very fine threadlike material held together by a small amount of cement substance. The soft and flexible bundles branch and interjoin. The small reticular fibers do not form bundles but branch to form a netlike supporting framework. They are numerous in glandular organs and between muscle fibers. Elastic fibers, thin shiny white fibers that are highly resilient, form networks by branching and joining freely.

Cells. Various types of cells can be found in connective tissue. Fibroblasts are found in most connective tissue and are the only cells found in the very dense tissues such as tendons (see TENDON). These cells are responsible for forming fibers. Fibroblasts are large and flat with numerous processes projecting to join the processes of other fibroblasts. Histiocytes, or macrophages, are distributed widely in the body. These cells are irregular in shape with short, blunt

processes. Under special conditions, such as inflammation, they show ameboid movement (see AMEBA) and remove foreign matter by ingesting it. Concentration of these cells varies throughout the body; collectively they form the reticulo-endothelial system (see RETICULO-ENDOTHELIAL SYSTEM).

In most connective tissue plasma cells are comparatively rare. They are found in greatest concentration in the mucous membrane lining the alimentary canal (see ALIMENTARY CANAL). These cells are round or slightly irregular with a small nucleus. Large granules of chromatin adhere to the nuclear membrane with such regularity as to make the cell look like a cartwheel. Mast cells are most numerous in the connective tissue surrounding blood vessels; they are large oval or round cells that resemble the basophilic leucocytes of the blood (see BLOOD). Although their origin and function are not clearly understood there is evidence that they may produce the anticoagulant substance heparin (see HEPARIN).

Ground Substance is a material part of connective tissue that varies from a fluidlike to a gel-like state. With the reticular fibers it forms supporting membranes for the capillaries, small veins, and the epithelium (see ORGANS AND TISSUES). This substance seems to be important in stopping the spread of harmful agents in localized infections.

CONNELLSVILLE, city, SW Pennsylvania, in Fayette County, on the Youghiogheny River, on the Baltimore and Ohio, the Pennsylvania, the Pittsburgh and Lake Erie, the Pittsburgh and West Virginia, and the Western Maryland railroads, and U.S. Highway 119; 36 miles SE of Pittsburgh. The surrounding area is rich in coal and natural gas. The city has railroad shops and produces coke, mining machinery, textiles, glass, paint, heaters, paper containers, and electrical equipment. A state hospital is located here. Pop. (1950) 13,293.

CONNELLY, MARCUS COOK, 1890– , U.S. playwright, was born in McKeesport, Pa. He won the Pulitzer prize in 1930 for his play *The Green Pastures*, an amusing and sympathetic treatment of Negro life, adapted from Roark Bradford's *Ol' Man Adam and His Chillun*. With George S. Kaufman, Connelly wrote *Dulcy* (1921), *Merton of the Movies* (1922), *Beggar on Horseback* (1924) and, with Frank Ball Elser, *The Farmer Takes a Wife* (1934). In 1930 Connelly also won the O. Henry Memorial award for *Coroner's Inquest*, a short story. He was elected president of the National Institute of Arts and Letters in 1952.

CONNEMARA, mountainous district, W Ireland, in the province of Connaught, County Galway, bounded by loughs (lakes) Mask and Corrib on the E and the Atlantic Ocean on the W. The region has a rugged terrain broken by narrow valleys and small loughs. Northern Connemara includes Benna Beola mountain range which rises above 2000 feet. The coast line is deeply indented and precipitous. The district is sparsely populated, with most of the villages located on the coast. Fishing, seaweed gathering, and hand weaving are the main occupations. Connemara is noted for its wild, picturesque scenery. Antiquities in the area include pre-Christian and early Christian relics, together with medieval castles. See GALWAY.

CONNERSVILLE, city, E central Indiana, county seat of Fayette County, on the Whitewater River, on the Baltimore and Ohio, the Erie, the Nickel Plate, and the New York Central railroads; 57 miles ESE of Indianapolis. Situated in a rich agricultural area, Connersville's industrial products include refrigerators, steel kitchen equipment, piston rings, automobile parts and accessories, paint, caskets, and rotary blowers. Pop. (1955 est.) 16,440.

CONNOLLY, THOMAS HENRY, 1870– , U.S. baseball umpire, was born in Manchester, England. He was an umpire in the National League, 1898–1900, joined the American League in 1901, and was the umpire of its first game. After 1931 Connolly was umpire in chief of the American League. He was elected to the National Baseball Hall of Fame in 1953, and retired from baseball the following year.

CONNOR, RALPH. See GORDON, CHARLES W.

CONON, died 687, pope in 686–87, succeeding Pope John V.

CONON, died ?392 B.C., Athenian commander, became one of the commanders of the Athenian fleet, in 406, after the fall of Alcibiades. In 405 he escaped with eight ships from the Athenian disaster at Aegospotami, entered the service of the Persian king, and in command of his fleet destroyed that of Sparta at Cnidus in 394. After expelling the Spartan governors from the Aegean Islands, he took Cythera. He returned to Athens in 393 and restored its fortifications. Sent to negotiate with the Persian satrap Tiribazus in opposition to the Spartan Antalcidas in 392, he was imprisoned by Tiribazus, but escaped. Conon died in Cyprus.

CONON OF SAMOS, Greek astronomer and mathematician, lived in the third century B.C. He discovered the constellation Coma Berenices, so named because he identified it with the tresses of the Egyptian queen Berenice, wife of Ptolemy III. Conon wrote seven books on astronomy (in which he included Chaldean observations on solar eclipses), composed a calendar giving the time of rising and setting of the fixed stars, and meteorological forecasts; and published several studies in conic sections, which formed the basis of Apollonius' fourth book of conics.

CONOWINGO DAM. See SUSQUEHANNA RIVER.

CONQUEST is the forcible appropriation by a state of a territory of another state, usually as a result of war or aggression in which an enemy's territory is occupied by the military forces of another belligerent. After the war the latter may acquire sovereign title to the occupied territory by a treaty of peace or by the recognition of such conquest by other states (such as the Italian conquest of Ethiopia). A more subtle technique of conquest was developed in modern times by some totalitarian powers, whose followers, by infiltrating another country's political institutions or by means of a *coup d'état* or a revolution, created a puppet government and then had such puppet government "invite" the foreign government to occupy the country. This technique was applied by the Nazis in respect to Austria and Norway and, with more success, by the Soviet Union in respect to the Baltic states and other neighboring countries.

In the past, military occupation alone transferred sovereignty to the conqueror, but in modern times sovereignty passes only when the invader formally annexes the territory and such annexation is recognized by other states. The Hague Conventions of 1899 and 1907 defined the rights and duties of occupying powers in time of war—accordingly the occupying power assumes the rights and obligations of the ousted state and the citizens of the occupied territory transfer their allegiance to the conqueror. The United States has followed the policy of nonrecognition of annexations arising from aggression.

History has recorded many examples of conquest. Empires of the Far East, Babylon, Egypt, and Rome, and the Russian, British, French, and other empires have all been based on conquest. More recent examples of conquest have been furnished by the Soviet Union, Japan, Nazi Germany, and Fascist Italy. See IMPERIALISM; INTERNATIONAL LAW.

CONQUISTADOR, one of the Spanish conquerors of the New World, especially in the sixteenth century. The Spaniards were ordinarily small bands of men in the midst of alien and usually hostile peoples far outnumbering them. They won by advantages such as horses, armor, and guns, but also by rapidity of movement, endurance of hardship, daring, vision, and will. Typically, the *conquistadores* were greedy for gold and ruthless in removing opponents. They explored or ventured into almost all habitable North and South America and conquered much of it, including the empires of Mexico and Peru. See ALMAGRO,

BROWN BROS.

Cortés, one of the foremost conquistadors, entered Mexico City in 1521. Heavily damaged in the fighting, the city was rebuilt to serve as the Spanish capital in Mexico.

Diego de; Alvarado, Pedro de; Coronado, Francisco Vásquez de; Cortés, Hernán; and Pizarro, Francisco.

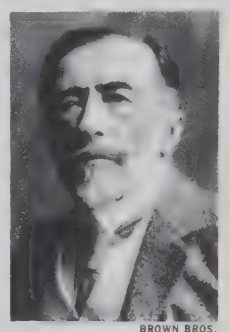
CONRAD I, died 918, German king, was chosen to fill the throne upon the extinction of the line of Charlemagne by the death of Louis the Child, 911. Conrad's reign was an unbroken period of unsuccessful strife against Lorraine, 912; Saxony, 912; Swabia, 916; and Bavaria, 917.

CONRAD II, 990?–1039, German king and Roman emperor, son of Henry, duke of Franconia. With the extinction of the imperial house of Saxony by the death of Henry II, the German people were compelled to elect his successor and in 1024 chose Conrad, who thus became the founder of the Franconian dynasty. In 1026 he crossed the Alps into Italy, subdued the Italian insurrections against his authority, and was crowned king of Lombardy; the following year he received the imperial crown at Rome. In 1032–34 he added the duchy of Burgundy to the empire. Toward the close of Conrad's life serious disturbances compelled him again to cross the Alps to Italy, where he succeeded in restoring order at the cost of many concessions to his Italian subjects. He died at Utrecht.

CONRAD III, 1093–1152, German king, founder of the Hohenstaufen dynasty, was the nephew of Henry V, who in 1115 made him duke of the Franks. When Henry died without leaving an heir, the choice of his successor fell to the German nobles, who chose Lothair the Saxon in preference to Conrad. On the death of Lothair in 1138 the throne was offered to Conrad, and he was crowned at Aix-la-Chapelle. He soon became involved in conflict with Henry the Proud, duke of Bavaria, who was the leader of the Guelphs, and thus began struggle between the Guelphs and Ghibellines which raged at intervals for a century (see Guelph and Ghibelline). With the death of Henry in 1139 there was a temporary peace and Conrad could turn his attention to other matters. St. Bernard of Clairvaux had stirred the people to a new crusade to deliver Jerusalem, and in 1147 Conrad set off for Palestine with a large army. His forces were virtually destroyed by disease and in battle; he returned broken in spirit in 1149, and died in Bamberg.

CONRAD IV, 1228–54, German king, member of the house of Hohenstaufen, son of the Emperor Frederick II, was born at Andria, Italy. He was elected king of the Romans in 1237, and after his father's death in 1250 became emperor of Germany. Confronted with the enmity of the pope, who excommunicated him, Conrad was defeated by the Imperialist candidate, William of Holland, at Oppenheim, 1251, and compelled to retire to his dominions in Swabia (of which he had been appointed duke in 1235). Having determined to strengthen the dominions of his house in Italy, Conrad entered Verona in 1251, subdued Apulia, and conquered Naples, 1253. While preparing to invade Germany to re-establish his authority there, Conrad died suddenly at Lavello.

CONRAD, JOSEPH, 1857–1924, English novelist whose career was remarkable in that he did not begin serious literary activity until he was past 30 years of age, and then in a language of which, just 10 years before, he had known virtually nothing. Born Teodor Józef Konrad Nalecz Korzeniowski in Russian-dominated Poland, Conrad was the son of Appolonius Korzeniowski, a Romantic poet and translator of several of Shakespeare's plays into Polish, who was active in the struggle for Polish independence. Conrad's mother, Evelina Bobrowska, of a more conservative cast than her husband, nevertheless followed him into political exile in northwestern Russia in 1862, taking her young son with her. Three years later she returned to Poland but soon died, leaving the boy in the charge of her brother, Thaddeus Bobrowski, who was Conrad's last intimate link with his family since his father's death shortly after his return from exile in 1869. Educated in the schools of Kraków and by private tutors, Conrad left Poland in the autumn of 1874, abandoning plans to enter the University of Kraków. In this period, Conrad was strongly drawn to all things Western simply because he hated all things Russian. Except for occasional brief visits, Conrad never returned to Poland.



BROWN BROS.

Joseph Conrad

In 1874 he arrived at Marseilles, France, armed with letters of introduction to an influential relative—a banker and shipper active in underground efforts for the restoration of King Carlos in Spain. Conrad soon was involved in running guns to Spain. His stay at Marseilles came to an unpleasant end when, as the result of a duel fought under mysterious circumstances with an American named J. M. K. Blunt, Conrad was seriously injured and suddenly bereft of friends. In 1878 he took a job as common seaman on the British vessel *Mavis*. When the *Mavis* reached England, Conrad, speaking little English, saw for the first time the country he was to serve for 15 years as a seaman, becoming eventually a master mariner in the British merchant marine. He became an English citizen in 1888 and in the same year assumed command of the *Otago*—his first full command. In 1890 he took a job on a Belgian steamer, but the journey up the Congo River was a difficult one and he returned from the Belgian Congo with mental and physical health seriously impaired. For a time he worked as a manager of warehouses for a London shipping firm but by 1893, still yearning for the sea, he shipped out again. He was forced for reasons of health to leave the vessel at Rouen in 1894, which ended his career as a sailor.

Conrad the Writer. In 1889 Conrad had started writing a story based on his knowledge of a Dutch trader in Borneo. In 1894, faced with the necessity of earning a living, he returned to this work, which was finally published as *Almayer's Folly* (1895), under the name Joseph Conrad. The book met with some success, and in the following year Conrad published *Outcast of the Islands*, depicting the earlier lives of some of the characters of the first book. In 1896 he married Jessie George, a young woman with no literary leanings and perhaps for this reason an ever-devoted wife. While on his honeymoon Conrad wrote much of *The Nigger of the Narcissus* (1897), which gained him a wider audience and was his best work to that point.

In a volume of five short stores entitled *Tales of Unrest* (1898), Conrad for the time moved in the direction of social irony. His first son, Boris, was born that year, and the family, out of financial necessity, took up rent-free residence with Ford Madox Hueffer (later known as Ford Madox Ford).

Although Conrad was accorded a measure of recognition by the Royal Academy in 1899 for *Tales of Unrest*, for which he shared a prize with three other authors, lack of confidence in his abilities as a writer led him to collaborate with Hueffer on *The Inheritors* (1900). But his own *Lord Jim*, published the same year, was a much better novel. *Youth* (1902) and *Typhoon* (1903) were collections of short stories, the former containing the famous "Heart of Darkness," a story of ominous "jungle evil," based in part upon his experiences in the Congo. *Romance* (1903) was another collaboration with Hueffer. The appearance of *Nostromo* (1904) heralded Conrad's most complex work to that date, dealing directly with politics and reconstructing the history of a South American country. In 1905, through the aid of Edmund Goss, Conrad was granted a civil list pension, and with his family traveled on the Continent. His second son, John Alexander, was born in 1906, the year which saw publication of *Mirror of the Sea*, a novel of maritime reminiscences. With *The Secret Agent* (1907), a novel about the European anarchist underground, Conrad's use of dramatic irony assumed full-scale proportions; in his hands what might have been just another popular spy thriller became a masterful symbolic presentation of both personal and international political evil. His concern with politics was also evident in the short stories published as *A Set of Six* (1908). During the next two years Conrad worked with Hueffer on *The English Review*. *Under Western Eyes* (1911) was, next to *The Secret Agent*, Conrad's most effective political novel, again dealing with complex human relationships in terms of personal and international political morality. In 1912 he put a series of reminiscent essays into book form as *Some Reminiscences* (later to appear as *A Personal Record*). *Twixt Land and Sea* (1912) included one of Conrad's finest short stories, "The Secret Sharer." The novel *Chance* (1912), first written for serialization in the *New York Herald*, brought the author his first large public and the largest financial rewards he had yet enjoyed as a writer. A volume of stories, *Within the Tides*, appeared in 1915, as did the novel *Victory;* and two years later he issued *The Shadow Line* (1917), based upon his experiences as commander of the *Otago*. In 1919 the Conrad family moved to their final home, Oswold, near Canterbury, and *The Arrow of Gold*, derived from his stay in Marseilles, was published. In 1920 he published *The Rescue*, and wrote a dramatization of *The Secret Agent*, produced in 1922.

Conrad made one last sea voyage, to America in 1923, and upon his return to England was offered knighthood, but declined. The unfinished novel *Suspense* (1925), *Last Essays* (1925), and *Tales of Hearsay* (1926), were published posthumously.

Conrad's Credo. In the famous preface to *The Nigger of the Narcissus* Conrad defined his creed as a writer, stating that it is the artist alone, as opposed to the scientist who "speaks to our capacity for delight, for wonder, to the sense of mystery surrounding our lives; to our sense of pity, and beauty, and pain; to the latent feeling of fellowship with all creation—and to the subtle but invincible conviction of solidarity that knits together the loneliness of innumerable hearts . . . which binds together all humanity—the dead to the living and the living to the unborn." And if the writer takes his task seriously (as Conrad did), the art of writing becomes an appallingly difficult one which demands that the artist delve deeply into the innermost regions of his own humanity—not only for the right idea but for the right word which alone is the fitting expression of that idea. Thus it was that Conrad struggled over "the shape and ring of sentences" trying to find "an approach to plasticity, to color," so that "the light of magic suggestiveness may be brought to play for an instant over the commonplace surfaces of words: of the old, old words, worn thin, defaced by ages of careless usage." Conrad's works stand as magnificent evidence that he achieved the goals he set for himself.

His highly original technique was extremely significant in literary history; writing as he did during an experimental period of the English novel, his career coincided in time with the work of the social critics, such as Galsworthy and Wells, as well as with the works of such as Kipling and Maugham, who deliberately chose exotic subject matter. Although Conrad might superficially appear to be aligned with the latter group, he actually remained independent and never committed himself to any literary "movement." Because of this independence he failed to win widespread recognition until the last years of his life, but as a result of his artistic integrity he was later to be seen as a decisive figure in the transition of the English novel from parochial Victorianism to full stature in European literature. Moreover, he helped to win for English writers the freedom of literary experiment onjoyed by such writers as James Joyce and Virginia Woolf. The Polish-born English writer's career was of a rare type—an uncompromising development of pure insight, of pure vision, and of pure craftsmanship. In sum, he was not merely a writer, but a poet as well. RACHEL GILBREATH

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CONRAD, MICHAEL GEORG, 1846–1927, German novelist, critic, and editor, was born in Bavaria. He was a leader of the "New German" movement, a school of literary naturalism, and in Munich founded the review *Die Gesellschaft* (1885–1901) as a vehicle for naturalistic writers of the period; almost every important writer of the time contributed to it. Conrad wrote several Zolaesque novels, but his critical writings were considered his most important works—*Madame Lutetia* (1883) and *Von Emile Zola bis Gerhart Hauptmann* (1902).

CONRADIN, or Conrad the Younger, 1252–68, duke of Swabia and the last of the Hohenstaufen dynasty, was born in Bavaria. His father, Conrad IV, died when "the Younger" was but two years old, and Manfred, his uncle, undertook to rule Naples and Sicily during the minority of the young sovereign. He was opposed in this by Charles of Anjou who, at the instigation of the pope, invaded Italy. The rival forces met at Benevento, 1266, where Manfred's defeat and death gave Charles possession of the kingdom. Charles proved to be a cruel and hated king and Conradin, though only a boy of 15, was persuaded by the Ghibellines to attempt to recover his inheritance. He was received with great honor in Rome, won a victory over the French at Scureola in 1268, but was subsequently defeated, taken prisoner, and executed at Naples by order of Charles. His brief but tragic career has supplied a theme for various romantic writers. See GUELPH AND GHIBELLINE.

CONRAD OF WURZBURG, German poet, was born in Würzburg. A pupil of Gottfried von Strassburg, he was one of the most important Middle High German poets—for the great number of his works, for the purity of his language, and for the correctness of his versification. His longest work is the unfinished *Trojanerkrieg*, containing about 40,000 verses. He died in 1287.

CONRIED, HEINRICH, 1855–1909, German-American impresario, was born in Bielitz, Austrian Silesia. He came to New York in 1878, starred in the principal German theaters of the country, and later

organized the Conried Opera Company. In 1892 he formed a stock company for the presentation of German drama, and from 1903 to 1908 was manager of the Metropolitan Opera House, where he gave Wagner's *Parsifal* its American première.

CONROE, city, SE Texas, county seat of Montgomery County, on the Missouri Pacific and the Santa Fe railroads, and U.S. Highway 75; 39 miles N of Houston. Situated in an oil- and lumber-producing area, Conroe refines gasoline and manufactures wood products. Pop. (1955) about 8700.

CONSANGUINITY signifies relationship by blood, as contrasted with affinity, the relationship created by marriage. It is of two kinds—(1) lineal, the relationship existing between an ancestor and a descendant in a direct line; and (2) collateral, the relationship existing between those who are descended from a common ancestor but not in the same line or branch of the family, and who therefore do not bear the relation of ancestor and descendant to each other. In civilized countries today, marriages made between lineal relations, however remote, are null and void.

The method of computing degree of collateral consanguinity in common law or canon law is to begin with the common ancestor and reckon downward. The number of steps the more remote of the two persons is from the common ancestor is the degree of relationship existing between the two persons in question. For instance, an uncle and a nephew are related to each other in the second degree, because the nephew is two steps distant from the common ancestor—the grandfather.

By civil law the computation begins with either of the persons in question and counts up to the common ancestor and then down to the other person in question. For example, from a nephew to his father is one degree, to the grandfather two degrees, and down to the uncle three, so the nephew and uncle are related to each other in the third degree. The civil law method is preferable in that it points out the actual degree in all cases, whereas, by the common law method, different relations may stand in the same degree. However, in cases of inheritance, both methods will establish the same person to be heir.

In English law, marriages between collateral consanguinei are void only when they stand in the first, second, or third degree to each other as computed by civil law.

In the United States the law as to validity of marriages between collateral relations varies among the states. In general, however, the statutes prohibit the marriage of first cousins and those of closer relationship. Under the laws relating to inheritance, lineal descendants are preferred to collaterals. See Affinity; Kin, Next of.

CONSCIENCE, HENDRIK, 1812–83, Flemish writer, was born in Antwerp. He volunteered as a private in the Belgian army during the revolution of 1830, serving for a period of six years. In 1837 he published his first novel *In't Wonderjaar 1566* (In the Wonderful Year of 1566), written in Flemish. Until that time there had been virtually no serious literature written in Flemish idiom, the language being considered vulgar by educated Belgians. Other authors, encouraged by the success of this book, followed suit, and in 1841 a Flemish Congress called Conscience's work the seed of a truly national literature. The Belgian king, Leopold I, expressed his desire that *Wonderjaar* be included in every Belgian school library, and under his patronage Conscience continued his literary production, which was eventually to comprise more than 100 volumes of novels, short stories, and historical works. His most characteristic writing is found in such sketches of Flemish village life as *Blind Rosa* (1850), *Rikketikketak* (1851) and *The Miser* (1853). In 1868 the post of keeper of the Royal Belgian Museums was created especially for Conscience, and in 1881 the occasion of the publication of his 100th book was declared a national holiday.

CONSCIENCE, the habitual sense of moral obligation, has been defined in various ways, ranging from "a pattern of inhibitory conditionings" to "the organized system of habits which are evaluated by reference to an ethical code." There is a consensus that the concept is associated with moral sanctions; however, the origin of the sanctions is a moot question. Theologians have pointed to God as the source. Philosophers such as Immanuel Kant associate conscience with imperatives related to the cosmic order, while some writers place its origin in intuition or instinct, designating it as an hereditary entity. Sociologists and anthropologists generally refer to its inception in the *social customs* and *mores* of the group. Under the influence of Sigmund Freud, psychoanalysts have given conscience a prominent place in their theories, classifying it as the superego, or that part of the mind which is the internal moral structure of the individual as opposed to the external controls placed on his behavior. See Folkways; Psychoanalysis.

Social psychologists hold that conscience is invariably associated with guilt feelings. The feelings are not considered "inborn." It is from social contact and communication that the individual learns attitudes of right and wrong and derives his responses to behavior which deviates from the "good." Conscience therefore differs from society to society, as the individual who is a product of a particular social system internalizes its prevailing taboos and regulates his conduct according to their dictates.

Although conscience is amplified by social institutions such as the church, the school, and the community, there is little reason for disputing the fact that the family is its basis. It is the family which assumes the social customs and mores of the culture and in turn passes them on to the children. Margaret Mead, the anthropologist, has listed three types of family structures which are considered conducive to the development of a strong conscience: (1) the family in which children are reared by the parents themselves, not by nurses or others; (2) the family in which parents use the threat of withdrawal of love as a form of punishment; and (3) the family in which the parents act as if they themselves had never done anything wrong, and hence had the right to expect that their children would be "perfect." M. H. Krout

CONSCIENCE WHIG, one of those members of the Whig party before the Civil War, especially in Massachusetts, who vigorously opposed slavery. Conscience Whigs usually supported the Wilmot Proviso. Some left the party in 1848 to join the Free Soil party. They generally opposed the Compromise of 1850, and particularly the provisions for the return of fugitive slaves. Their opponents were often called Cotton Whigs on the ground that their support of compromise grew out of their interest in the cotton trade. In New York divisions of the same kind existed between the supporters of William H. Seward, sometimes called "Woolly Heads," and supporters of Fillmore and compromise, called "Silver Grays."

CONSCIENTIOUS OBJECTOR, one who resists, on religious or ethical grounds, the efforts of a state to compel his participation in social action which he construes as improper violence or injustice. In the United States conscientious objection has frequently occurred as opposition to war, usually among such religious groups as the Quakers, Mennonites, Brethren, and Jehovah's Witnesses. During the American Revolution conscientious objectors to military service were frequently exempted on securing a substitute and paying a fine. In the Civil War the North granted exemption to sectarians on payment of a commutation fee and showed considerable leniency to those who felt they could not make such payments in good conscience. Treatment in the South was much harsher.

Conscientious objectors in World War I were given noncombatant military duty or were placed in

urgent civilian service, usually in agriculture. Nearly 500 were imprisoned, and charges of mistreatment were numerous. Political objectors were given less consideration than those of recognized religious sects.

In World War II the National Service Board for Religious Objectors was established under the Selective Service Act to provide for civilian public service in place of military duty. Those who had been officially recognized as objectors were sent to camps operated by the Friends' Society, Brethren and Mennonite churches, the Federal Council of Churches of Christ, the Association of Catholic Conscientious Objectors, and various camps under nonreligious administration. The majority of the 8000 objectors worked without pay or maintenance in forestry and conservation service, mental hospitals, agriculture, and in the coast and geodetic services. Some, however, were convicted of draft violation. See PACIFISM; CONSCRIPTION.

CONSCIOUSNESS is the entire range of an individual's mental processes. The concept, a product of philosophical reflection, entered science through the structuralist school of psychology when its proponents, who studied the "structure of the mind," adopted consciousness as the key word of their system. On the assumption that physics deals with experience as an independent entity, while psychology deals with it as an experiencing individual, the structuralists stated that an experiencing individual was, of necessity, a conscious individual.

Psychologists have described consciousness as varying in degree from what is experienced in moments of high intensity or maximum mental effort (as in solving a mathematical problem, playing a game of chess, or watching a football game) to states of low intensity and limited capacity for concentration (as in drowsiness). They point out that it is always limited to personal, or individual, responses. In states of high concentration, consciousness becomes unified and integrated, and is characterized by alertness of perception. Sigmund Freud and E. Von Hartman were among the first to distinguish between the unconscious and the conscious, though popular thinking had long differentiated between those activities of which an individual was aware and those of which he was not.

The Gestalt school of psychology offers a broader understanding of consciousness and its counterpart, unconsciousness, in the unified field theory. (See GESTALT PSYCHOLOGY.) Gestaltists conceive of all mental processes as aspects of the field of the senses, and regard experience as real only in so far as it is perceived by an individual at the instant of response. In the Gestalt theory, an individual can have *more* or *less* consciousness, but not consciousness or unconsciousness.

In the terms of the unified field theory, highly conscious experiences are highly specific responses to specific stimuli, differentiated from other available stimuli. Conscious responses, then, are those accompanied by the greatest degree of concentration. Vague responses are relatively undifferentiated parts of the field of experience. To the extent to which the parts can be differentiated they can be brought into consciousness; to the extent which they cannot they must be regarded as less and less conscious.

Consciousness is one field, one experience, and one area, therefore, with a variety of differentiable stimulus-objects, situations, or relations to which the individual reacts with a varying degree of vividness of perception. See PSYCHOANALYSIS; UNCONSCIOUS, THE.

M. H. KROUT

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UP

On Oct. 29, 1940, Secretary of War Henry L. Stimson drew the first number capsule under the Selective Service Act, the first peacetime draft in United States' history.

CONSCRIPTION is the selection of military personnel on a compulsory basis.

Militias. The authority of a sovereign state to call its citizens or subjects to service in defense against an outside enemy has been recognized in law and tradition for thousands of years, long antedating the rise of the modern state system. Militias of such character were formed and employed by the Greek city-states, the Republic of Rome, the city republics of medieval Italy, and the great cities of the Low Countries. In the words used for the enrollment of Roman citizens for the Roman Legion, *conscribere milites*, we find the origin of the words *conscription* and *militia*.

The Saxon *fyrd* was a militia. It is the legal antecedent of the militias established by the constitutions of various states of the United States, and recognized in Article II, Section two, of the Constitution of the United States, in the sentence that states, "The President shall be Commander in Chief . . . of the *Militia of the several States*, when called into the actual Service of the United States."

Yet the obligation of the citizen militiaman to defend his homeland against an invading enemy is not generally considered to be conscription. The obligation of militia service is legally in being at all times. All ablebodied male citizens between the ages of 18 and 45 (to use the constitutional provision of one state, Illinois) are automatically members of the militia and subject to the responsibilities thereof. In contrast, the act of conscription is a positive act, and the length of conscripted military service is a limited term.

Securing Military Personnel. Conscription is one of two methods of securing manpower to be trained and formed into a national soldiery. The other method is recruitment. In military history a sharp distinction between recruitment and conscription cannot be made. Where conscription has existed, volunteering has been permitted to anticipate conscription. In many nations in times past, furthermore, the potential conscript has been allowed to furnish a substitute or to discharge his obligation by the payment of a sum of money.

Volunteer armies become professional in character as men re-enlist again and again because of their taste for military life. Professional soldiers will often serve other nations than the one to which they owe allegiance. Thus, the bulk of the British troops employed in the endeavor to suppress the American Revolution were Hessian mercenaries.

Professional armies were dominant during the Middle Ages, particularly before the musket came into common use. The cost of the weapons of war was high. The chief element of cost was the suit of armor of the individual soldier. The suit had to be forged to fit him. A professional soldiery could only be afforded as trade and commerce flourished.

believed to exist in sufficient quantity to supply man's needs for all time to come. Free use of these materials is sound policy. See BUILDING STONE; CLAY; COAL AND COAL MINING; SALT.

Water has been regarded as a permanent and abundant resource. Yet, uncontrolled runoff has caused much soil erosion and loss of fertility and many serious floods resulting in losses of life and property. Underground water supplies have shrunk markedly in some sections of the country since 1900. Uneven distribution of rainfall in the different parts of the United States resulted in serious and prolonged droughts in the Great Plains three times in the twentieth century. Intelligent use of water does not mean its free use but the controlled use of it to assure maximum value to all the people. Some of the control must be supplied by federal, state, and local units of government, and some must be supplied voluntarily by the people who own and use the land since they are the first custodians of the water supply that falls as rain, sleet, or snow. The conservation, management, utilization, and controlled disposal of water is one of the most complex conservation problems. See WATER.

In addition to the natural resources which supply raw materials for man's needs and luxuries, there are certain other resources, such as scenery and natural phenomena, which are important to the enjoyment, recreation, and health of mankind. Most of such resources cannot be replaced so they must be protected and preserved while being seen and enjoyed by generation after generation.

Conservation Needs in the United States. When the United States was first settled, the very abundance of the natural resources available to the pioneers prevented most of them from thinking clearly about future needs. Some great colonial leaders, notably George Washington, Patrick Henry, Thomas Jefferson, and William Penn, called attention to the need for use without waste but their warnings were not heeded.

As recently as 1900, when the United States had a population of about 76 million people, few persons were aware of the need for a conservation policy. Since then, the population of the United States has more than doubled and the standard of living is much higher. Growing demands for goods and services resulting from the growing population, the greatly increased number of wage earners, and higher pay and shorter hours among working people have resulted in more leisure time and the greater use of natural resources. Two world wars in a single generation reduced the known reserves of certain fuels and metals and led to much misuse of soil resources. Reduced reserves and the fact that natural resources such as ores and oil, timber, grass, and crops mean jobs and profits to millions of persons indicate the economic importance of conservation. The need for a continuing and improved conservation policy in the United States is further emphasized by the desire of other nations, from which we have imported large amounts of raw material, to use their natural resources at home.

Care of Individual Resources. Soil and fresh water are the basic natural resources of most concern to man and are believed to be in abundant supply for all time to come. Soil and fresh water resources are linked by nature and their conservation must be considered together.

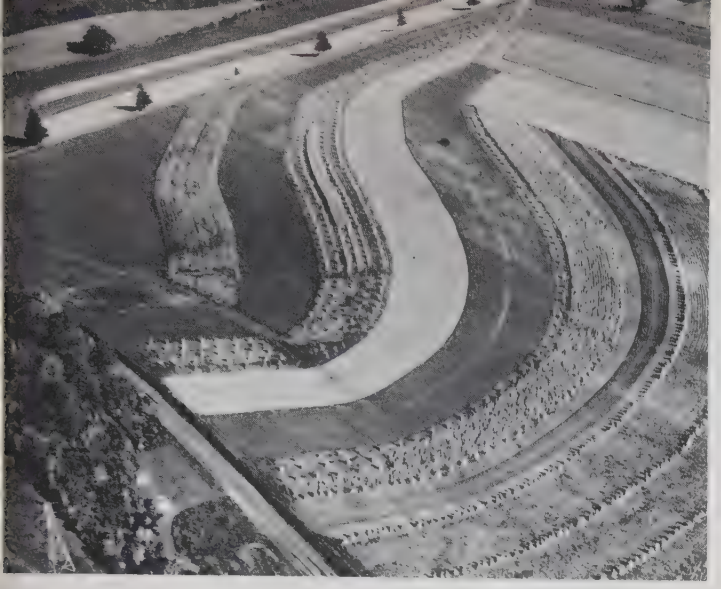
Soils contain living organisms, decaying plants and animals, and essential elements for plant growth. Most of the products supplying man with food, clothing, and shelter come directly or indirectly from such plant growth. The layer of soil covering the earth varies in depth and in natural fertility. In many areas the layer is thin and in others, where the layer is comparatively deep as in the case of deep sands, the inherent capacity to produce is low. Misuse and abuse of the soil have resulted in the loss of some of the topsoil from broad areas of the United States. It is estimated that 35 million acres of soil originally suitable for cultivation can no longer be used for this purpose. Twenty-five of the 35 million acres were lost as a result of sheet and gully erosion and of soil blowing. The other 10 million acres were lost as a result of water logging, salting, sediment deposition, and other causes. An additional 50 to 100 million acres of soil, not originally suitable for cultivation but which were cultivated, have since been abandoned. This misuse of the soil for the production of crops and its deterioration in such use has seriously affected its capacity to produce trees and grass for which it was originally suited. In 1956 the total cropland in the United States was estimated to be about 480 million acres, including about 70 million acres in rotation pasture. The physical deterioration of cropland was critical on about 25 per cent of the total or about 120 million acres. In addition about 130 million acres were deteriorating at a serious rate. On about 230 million acres there was little or no deterioration taking place. These included level, deep undamaged soils and those stabilized through the use of the right combination of conservation practices. About 40 million cultivated acres were not suitable for such use and should have been retired to permanent vegetation before their capacity to produce trees and grass was permanently impaired. There was, however, an ample supply of soil, still in grass and trees, suitable for crop production when safeguarded with conservation practices. These acres could be diverted to cultivated crops when the large supplies of wheat, corn, cotton, and rice might no longer exist and when the demand for such farm products made it profitable for the owners to clear the trees from the soil or to break it out of the grass sod. Such conversion would require proper inventory and classification of soil resources to avoid the historic mistakes of the past. See SOIL CONSERVATION.

Water is essential to man's existence because the human body, plants, and animals depend upon it for life processes. Soil will not produce plants for food, clothing, and shelter without water. Natural and artificial waterways are still an important way to transport goods. Irrigation water makes possible the use of productive soil in the arid and semiarid parts of the United States. Supplemental irrigation has expanded rapidly in the more humid areas to assure production of valuable crops. Water is an important resource to industry: 65,000 gallons of water are used in manufacturing a ton of steel. Water is a major source of power and provides many of the recreation facilities of man. Lack of water can limit the growth of a city or check the establishment of industries. The importance of water is emphasized by the fact that while the United States population doubled from 1900 to 1955, the use of water quadrupled. See IRRIGATION; WATER POWER; WATER SUPPLY; WATERWAYS, INLAND.

The interrelationship of soil and water conservation problems is shown by the fact that about five-sixths of the available water supply in the United States comes from surface water—streams, lakes, reservoirs, ponds, and runoff stored in tanks. Soil conservation is doubly important because of the need to protect this major part of the water supply. The land treatment program is the best way known to increase renewal of the underground water supply.

Forests and farm woodlands in the United States supply almost all the wood products used and provide grazing for domestic livestock and wildlife. Forests, especially those at the higher elevations, protect the water supply that comes as rain or snow and regulate the runoff.

In 1956 about 622 million acres in the United States were classified as forest land, of which only 460 million acres were commercial forest land. The farm woodlands were made up of 85 million nonpasture acres and 135 million acres of woodland pasture. Such woodland pastures produced very little timber and did not add much to the production of



CONSERVATION

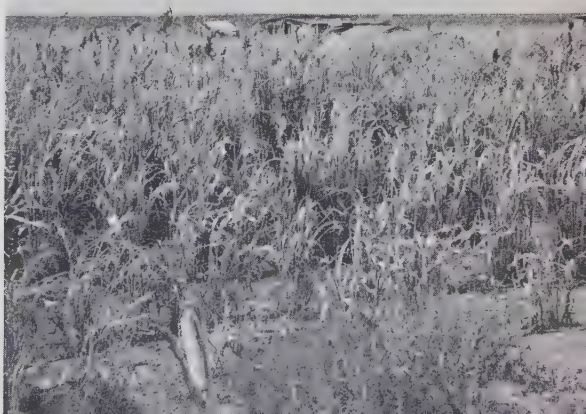
Higher yields and reduced soil erosion are the rewards of strip cropping shown practiced here.
USDA

A case of advanced gully erosion is illustrated, left, showing what happens when erosion caused by natural runoff is not controlled. The erosion was so far advanced here that an earth dam was constructed to back up the water to the head of the gully, right, thereby conserving both the water and soil formerly lost through runoff.

USDA

Wind erosion caused the abandonment of this farmstead in eastern Colorado, where no provision had been made for the planting of cover crops or grasses to prevent erosion.

Four and one-half months later the appearance of the field was much changed, stabilization having been effected by the planting of a cover crop of sudan cane and broomcorn.
USDA



U.S. FISH AND WILDLIFE SERVICE

These young American egrets, in a nest at Matheur Refuge, Ore., members of a species once close to extinction because of plume hunters' raids, are now on the increase.

meat and wool. It is one of the major land use and treatment problems on many farms. In 1950 the total cut of all timber about equaled the total annual growth. However, the annual cut of saw timber was about 50 per cent greater than that maturing to saw-log size. The control problem was acute on the 262 million acres of commercial forest land that was owned in small tracts (less than 5000 acres) by more than 4 million individuals. It was estimated that only 15 per cent of the area in these small tracts was being wisely managed to produce successive crops of saleable timber. Although much reforestation progress was made after World War II, it was estimated that 75 million acres of forest land, of which 44 million acres was on farms, would need to be planted or seeded if they were ever again to produce saleable timber. See FORESTRY; LUMBERING.

Grasslands provide most of the feed for livestock that contribute about one-half of the agricultural income in the western states. Much of this grassland is native range that was never plowed so that its conservation requires a different method from that for cropland and tame pasture conservation in the humid areas of the United States. There is some native range in Florida, Louisiana, and Arkansas but most of the grasslands in the humid areas are in small improved or tame pasture fields on farms. These humid area pastures also help to meet the feed requirements of livestock, an industry that provides income on an ever-increasing number of farms in the eastern states.

In 1956, nearly 240 million acres of land were grazed in the 31 eastern states and about 780 million acres in the 17 western states, making a total of 1,020 million acres. This total included about 320 million acres of woodland grazed. About 70 million acres of grassland, mostly in the humid areas, were occasionally cultivated for short periods to re-establish high forage-producing, weed-free pastures. Land producing only grass totaled about 630 million acres, of which nearly two-thirds or 415 million acres were privately owned. About 4 million acres of grassland were irrigated; nearly 100 million acres of rangeland were in need of reseeding. Brush removal would have improved forage production on about 150 million acres. Stock-water development would have permitted more uniform grazing and harvesting of forage that was being partially lost from about 235 million acres. See PASTURE.

Wildlife was an abundant resource on the North American Continent in pioneer times and provided much of the food supply of the early settlers. Although wildlife, including fresh-water fish, supplies only a small part of the food consumed in the United States, it is a valuable renewable resource. Hunting and fishing provide healthful outdoor recreation to millions of persons. The wildlife supply is largely determined by the adequacy of food, water, and cover and the effective enforcement of game laws. Some species of wildlife formerly abundant are now extinct and others almost so. The great buffalo herds that supplied most of the food, clothing, and shelter for the nomadic Plains Indians were all but exterminated by the hide hunters after the Civil War. The few hundred left are protected in parks, game preserves, and on the ranches of a few public-spirited citizens. Wildlife conservation is a co-operative effort among federal, state, and local agencies and groups, and 5 million farmers and ranchers. Game preserves, protected breeding grounds, and refuges are needed to maintain and increase the wildlife population but the efforts of the private owners of more than 1 billion acres of land are also required. Food, cover, and clean water for wildlife on farms and ranches are needed and game laws must be enforced to assure a thriving supply. Fresh-water fish have suffered from the pollution of streams by industrial and other waste and by sediment from untreated croplands. Wildlife conservation is a vital part of the broader soil, water, range, and forest conservation program. See FISHERIES; GAME LAWS; GAME PRESERVES; HUNTING.

Energy Sources are abundant in the United States when the total reserves of all kinds are considered. Energy sources include sunlight, wind, water power, gas, oil, coal, and nuclear or atomic power. Sunlight or solar energy is believed to have many commercial applications, although research in this field has not been extensive. In 1956 about 50,000 solar water heaters were in use in Florida, indicating one of the potential uses of this source of energy. For centuries winds have been harnessed to pump water; yet the use of windmills to produce electricity has not been adequately tested. Water power turned the grain mills of pioneer America; it is now one of the chief sources of energy in the production of electricity. Nearly all the water used to produce hydroelectric power is available downstream for irrigation, home and industrial uses, navigation, and for recreation. Most of the reservoirs needed to impound water for hydroelectric power generation are available for recreation. Oil, gas, and coal burned as fuel to operate steam-generating plants are lost from the fuel reserve. Where reservoir and generating plant sites are available, it is desirable to use water power to produce needed electricity.

After World War II, the energy outlook was promising. Coal reserves seemed adequate for many years to come but the known reserves of oil and gas were not. Many factors brightened the situation—the proved reserves of crude oil increased at an average annual rate of 4.5 per cent from 1928 to 1955. The United States had vast amounts of oil in oil shale which

Seedlings on a tree farm in the United States. Planned reforestation of commercial forest land has helped meet all but a small part of the nation's annual lumber needs.

AMERICAN FOREST PRODUCTS INDUSTRIES

could be recovered commercially when needed; coal could be converted into a natural gas substitute; and substitutes for oil, including alcohol, were available when needed. The potential of nuclear or atomic power was very promising. Such power could well relieve any future strain on the conventional sources of energy. The known reserves of uranium were growing and more deposits were being found in the United States and Canada. See ATOMIC ENERGY: ELECTRIC POWER; NATURAL GAS.

Nonfuel Minerals include the metals, such as iron and copper, and the nonmetals, such as lime, fertilizer, and chemical raw materials. The United States had the greatest variety of minerals of any nation and, in some cases, the greatest known quantities. It also used its supply at a faster rate than any other nation. Tin, lead, zinc, manganese, platinum, mercury, and iron were among the minerals imported by the United States. New reserves of some needed minerals were being discovered within the country and in Canada and Mexico. Improved methods of mining and processing were conserving the supply and research was pointing the way to greater efficiency in recovery. The use of metallic substitutes, especially plastics, was growing and could help meet the demands of the future. The supply of nonmetallics such as lime, phosphates, and sulfur was believed to be adequate, but the United States imported certain of other fertilizers and chemical raw materials. See FERTILIZER; METAL.

SIGNIFICANT STEPS IN CONSERVATION

1832 Hot Springs National Park (Ark.) was established by an act of Congress.

1849 Department of the Interior was created. It was the first housekeeper for the federal government, but by 1950 had become the custodian of the natural resources (except forests) of the federal lands. It administers federal policies relating to numerous other natural resources.

1862 Department of Agriculture was created. In the beginning the department was primarily concerned with research and regulatory duties. In the twentieth century it became the center for federal activities in the conservation of soil, water, forests, grass, and wildlife on the privately owned lands of the United States. The Forest Service is an agency of the department and administers the national forests.

1871 Yellowstone National Park (Wyo., Mont., Idaho) was established.

1873 American Association for the Advancement of Science presented a memorial to Congress calling attention to the condition of the natural resources of the nation.

1875 American Forestry Association was organized. It publishes a monthly magazine, *American Forests*.

1879 United States Geological Survey was established.

1890 American Association for the Advancement of Science again memorialized Congress on the condition of the nation's natural resources.

Yosemite, Sequoia, and General Grant National Parks (all in California) were established. General Grant National Park was abolished in 1940 and became a part of Kings Canyon (Calif.) National Park.

1891 Conservation Act of 1891 authorized the president to withdraw forest lands from the public domain and establish national forests to conserve timber, regulate water flow, and control grazing. This was the first comprehensive enabling act for the conservation of natural resources on federal lands. Yellowstone Park and White River Plateau (Colo.) Timberland Reserves, totaling 2,437,120 acres, were set aside under the new act during the year.

1899 Mount Rainier (Wash.) National Park was established.

National Soil Survey was authorized by Congress.

1900 Society of American Foresters was formed.

1902 Reclamation Act, providing help in developing irrigation districts in 17 western states, was passed.

International Association of Game, Fish, and Conservation Commissioners was formed.

1905 Forest Service was established to administer the growing number of national forests.

Control of grazing in the national forests under a fee system was authorized.

1906 National Association of Audubon Societies was formed.

Congress authorized the adoption and enforcement of a system of water power leases in the national forests.

1907 Inland Waterways Commission was established.

1908 White House Conference of state and territorial governors met in May on invitation of President Roosevelt. The conference favored co-ordinated action and recommended the creation of national and state commissions to devise means of co-operation. President Roosevelt appointed 49 well known scientists, industrialists, and publicists to the National Conservation Commission. Many governors and several national societies also appointed conservation groups. The national commission made a hurried inventory of the nation's resources.

Joint Conservation Conference was held in Washington, D.C., on December 8–10, attended by governors, state commissioners, and representatives of 60 national organizations. It confirmed the report of the national commission on the condition of the nation's natural resources.

1909 International Conservation Conference was held in Washington, D.C., on February 18 on invitation of President Theodore Roosevelt with delegates from Canada, Mexico, and the United States.

Congress authorized the withdrawal from private appropriation of water power sites on public lands.

Congress reserved the mineral contents of homesteaded public lands for the federal government.

1910 Treaty was made with Canada regulating the use of the waters of Niagara Falls.

The Conservation of Our National Resources, a study by C. R. Van Hise, based on the inventory and report made by the National Conservation Commission, was published. It directed increased attention to natural resources, and conservation education had its real beginning in this study. By 1956, 12 states had made compulsory the teaching of conservation in secondary schools.

1911 National Drainage, Conservation and Flood Control Congress was organized.

United States Bureau of Mines was created by Congress.

Appalachian and White Mountain forest preserves were created by executive order of the president.

1912 Game Conservation Society was organized.

1913 Migratory bird law was enacted by Congress.

1914 Coal lease act was passed by Congress.

1915 Congress authorized recreation camps in the national forests.

1916 Migratory bird treaty with Canada was concluded.

National Park Service was created by act of Congress. The new agency was instructed to manage the national parks "to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." In 1956, the National Park Service had 180 national parks, monuments, and historic sites where native flora, fauna, historic objects, and natural phenomena were given full protection.

1919 National Park Association was organized.

1920 Congress provided for the operation of public lands containing coal, phosphate, sodium, oil, oil shale, or gas (later amended to include potassium) under federal lease and regulation.

Congress authorized the Secretary of the Navy to administer naval oil reserves directly or by lease. This act established a new federal policy of government production for use.

Federal Power Commission was created by act of Congress and given the power to license private hydroelectric projects on federal lands and on the navigable waters.

1922 Izaak Walton League of America was organized. The League publishes a monthly magazine, *Outdoor America*.

American Nature Association was organized. It issues a monthly publication, *Nature Magazine*.

1929 Congress authorized 10 erosion experiment stations where soil and water losses under varying soil, slope, climate, and use conditions could be measured. Numerous federal and state stations later engaged in this kind of erosion research.

1931 Congress authorized the inclusion of federal lands in co-operative plans of development and operation for oil and gas fields.

1933 Soil Erosion Service was established as an emergency agency in the Department of the Interior to demonstrate soil and water conservation practices in small watershed projects.

U.S. FISH AND WILDLIFE SERVICE

The banding of Canada geese, at the Patuxent Research Refuge, Md., is an important step in wildlife management toward determination of the range of migratory waterfowl.

Tennessee Valley Authority was created by act of Congress to develop and conserve the resources of the Tennessee River Valley. The TVA built multiple-purpose dams for flood control, hydroelectric power, and navigation. The electricity it generated and sold led to industrial development and the electrification of most farms in the area. The Authority also promoted soil and water conservation on the lands of the watershed.

Emergency Conservation Work agency was established to help relieve unemployment. The young men 17 to 23 who were assigned to the camps made the first widespread attempt to establish conservation demonstrations on the land. In 1937, it was replaced by the Civilian Conservation Corps. Over 3 million young men and veterans of World War I served in CCC camps between 1937 and 1943. The corps planted 2,356 million trees, built 126,000 miles of roads and trails, erected 46,854 bridges and culverts, reduced forest fires over 2,158,000 acres of forests, built 6,660,-223 check dams to control soil erosion, and improved the stands of 4 million acres of timber.

1934 Taylor Grazing Act was passed by Congress. Under this act and later amendments, 142 million acres of federal lands were withdrawn from entry and most of this acreage was included in grazing districts. The Bureau of Land Management and local boards of livestock producers for each district work together to regulate grazing and improve federal range lands.

Great Plains Shelterbelt Project was launched with emergency funds. Plans called for $75 million to be spent for belts of shrubs and trees to be planted at intervals from Canada to the Gulf of Mexico. When the original allocation of $5 million was exhausted in 1942, the technical leadership of the work was transferred from the Forest Service to the Soil Conservation Service and much of the work was continued by local conservation districts in the Great Plains.

1935 Soil Conservation Service was created by Congress as a permanent agency of the Department of Agriculture. It replaced the Soil Erosion Service and assumed the demonstration work on small watersheds, In 1956 this agency was responsible for technical assistance to 2690 soil conservation districts and for the watershed project activities of the Department of Agriculture.

Congress passed an act regulating interstate and foreign commerce in petroleum and petroleum products.

Bituminous Coal Conservation Act was passed by Congress.

1936 Omnibus Flood Control Act was passed by Congress. It recognized the place of conservation treatment of watershed lands as an integral part of flood prevention. Control works, such as dams, levees, and floodways, on the major streams were made the responsibility of the Corps of Engineers. The land treatment program was assigned to the Department of Agriculture.

1937 President Franklin D. Roosevelt asked the governor of each state for soil conservation district enabling acts. By May 19, 1947, every state and Hawaii, Alaska, Puerto Rico, and the Virgin Islands had enacted the legislation requested. In 1956, the 2690 soil conservation districts included 1,507,531,624 acres and 4,902,-151 members. Soil conservation districts are political subdivisions of the state and are governed by boards of local farmers and ranchers. The Soil Conservation Service and other federal and state agencies enter into working agreements with each individual district. Each district is charged by state laws to conserve soil, water, forests, grasslands, and wildlife resources and to reduce flood damages within its boundaries.

1938 Agricultural Adjustment Agency was created by an act of Congress which broadened the Soil Conservation and Domestic Allotment Act of 1936. The original AAA was declared unconstitutional by the Supreme Court. An important function of the new AAA was to share the direct costs of conservation practices with farmers and ranchers. This agency and its successor, the Agricultural Conservation Program Service, paid part of the cost of specified conservation practices. This cost sharing encouraged many farmers and ranchers to establish more rapidly conservation practices on their lands.

1943 Soil Conservation Society of America was organized.

1944 Congress authorized the Department of Agriculture to establish projects for soil erosion prevention and waterflow retardation on 11 watersheds—Buffalo Creek (N.Y.); Potomac River (W.Va., Va., Pa., and Md.); Coosa River (Ga.); Yazoo River (Miss.); Little Tallahatchie River (Miss.); Little Sioux River (Iowa); Washita River (Okla.); Trinity River (Tex.); Middle Colorado River (Tex.); Los Angeles River (Calif.); and the Santa Ynez River (Calif.). Flood reduction plans for these watersheds were prepared under the Omnibus Flood Control Act of 1936. Building of the various works of improvement was delayed by World War II but was planned to be completed between 1967 and 1975.

1946 National Association of Soil Conservation Districts was organized.

Natural Resources Council of America was formed to co-ordinate the efforts of many groups interested in the sound management of natural resources in the public interest.

1947 American Society of Range Management was organized.

1948 Inter-American Conference on Conservation of Renewable Natural Resources was held at Denver, Colo., with 22 nations of North and South America participating.

1949 The United Nations Scientific Conference on the Conservation and Utilization of Resources was held at Lake Success, N.Y.

1950 Defense Production Act, and later amendments, made the Department of the Interior responsible for conservation activities relating to petroleum and gas, solid fuels, electric power, fishery products, and metals and minerals.

1952 Congress allotted funds to the Department of Agriculture to inaugurate a pilot watershed protection program on about 60 small projects in 38 states.

1953 Mid-Century Conference on Resources for the Future was held in Washington, D.C., Dec. 2–4.

1954 Congress passed the Watershed Protection and Flood Prevention Act which provided for the co-operation of the Department of Agriculture with local sponsoring organizations for improvement work on watersheds less than 250,000 acres in size. These were not restricted to flood damage reduction but could include drainage and irrigation. The federal government was to share the cost for the flood prevention features.

Measures in Other Countries

Canada. Because of the abundance of its natural resources as contrasted with its relatively low population, Canada has not needed strong conservation policies. It contains one of the great forest regions of the world, consisting of mixed conifers and hardwoods. Along the northern margin is an enormous supply of pulpwood, while the western slopes of the Rocky Mountains and the Coast Range are covered with forests of evergreens ranging from 200 to 300 feet in height. Beyond the Great Plains to the east lie the great Canadian forests abounding in fur-bearing animals and capable of perpetual supply under the

protective regulations of the national and provincial governments. Water power possibilities in many parts of Canada are enormous. Low-grade coal resources are large and other minerals are found in abundance. Since World War II, huge strides have been made in tapping Canada's natural wealth in such fields as oil and natural gas, uranium, lumber products, water power sources, iron, nickel, and other metallic ores, asbestos, and pulpwood for paper. Following many years of discussion with the United States, Canada took the initiative in 1953 to build a continuous 27-foot-deep seaway on the Saint Lawrence River from the head of the Great Lakes to the Atlantic Ocean, thus permitting large ocean vessels to sail into the heart of the North American Continent. The project required agreement with the United States on the hydroelectric power development features of the project, and agreement was reached and construction begun in 1954. The two countries were to share costs and the power produced. See CANADA; SAINT LAWRENCE RIVER.

After Canada had participated in the International Conservation Conference called by Pres. Theodore Roosevelt in 1909, the Canadian Parliament established a 32-member permanent Commission of Conservation. With a membership consisting of federal and provincial government officials and private citizens, the commission promoted conservation legislation. Canada has established an extensive system of national parks and the Prairie Farm Rehabilitation Act of 1935 provided federal assistance in the control of wind erosion in the Prairie Provinces, an extension of the Great Plains of the United States.

Mexico. Although Mexico is rich in oil, minerals, and hardwood forests, its soil has suffered from much erosion. The conservation movement has made considerable progress in Mexico since participation of that country in the International Conservation Conference in 1909. The Constitution of 1917 made possible the breakup of the large landed estates and better use of the land. By the same act the returns from mineral lands were reserved to the state. Mexico established a soil conservation service in 1948 patterned after the United States service. Its major efforts have been aimed at making an inventory of the soil resources and establishing demonstration areas. See MEXICO.

Other Countries. The United States is dependent upon the world supply of several raw materials, especially those industrial raw materials imported to supplement domestic production. Among its greatest needs from foreign sources are nickel, cobalt, tungsten, chromite, and columbite; almost all of its tin, natural rubber, and cordage fibers must be imported. The United States imports a large part of the zinc ore mined in Canada and all of the Mexican output. Copper is bought from Chile, and oil and iron ores are imported from Canada and Venezuela. Sixty per cent of the bauxite supplies come from abroad. Coconut oil is obtained from Indonesia; palm oil (used in the manufacture of tin plate) and cold rolled steel from the Belgian Congo; silk from Japan and Iran; special cotton for airplane fabrics from Sudan and Persia; and castor oil (for brake fluids) and nylon from Brazil. The United States is the world's largest importer of timber products, buying mainly from Canada and the Scandinavian countries.

Much private capital has been invested abroad to assure the continuing flow of these raw materials. The United States government has made loans to foreign countries to help them develop the sources of the needed raw materials and has assisted them by supplying experts to improve extraction and processing methods. United States capital has been responsible for the discovery of important deposits of oil and ore abroad. Large reserves of natural resources in South and East Asia, Africa, and South America tend to lessen the pressure on some of the raw materials in short supply in the United States. No accurate surveys have been made of the raw material reserves in many countries, and many nations have not established conservation practices for these natural resources. See NATURAL RESOURCES.

In the conservation of soil and water, the growing population pressure on the land has led many nations to establish soil conservation agencies. After World War II, the United States Soil Conservation Service trained hundreds of technicians from about 85 countries in soil and water conservation. Other government agencies and the Food and Agriculture Organization of the United Nations employed United States conservation experts to help many countries. See MINING; NATIONAL PARKS; PARK, PUBLIC; RECLAMATION; TENNESSEE VALLEY AUTHORITY.

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CONSERVATION OF ENERGY, LAW OF, an explanation of the equivalence of all forms of energy. The sum of all energies in any isolated system remains constant; that is, any form of energy can be changed into another form of energy without loss or gain in the quantity of energy involved. Ages ago the energy of the sun indirectly produced coal, which can be burned to produce heat that will convert water to steam. The energy of the steam can be utilized to form mechanical energy, which in turn can be converted into electrical energy. Letting E stand for energy, the processes can be expressed as follows:

E coal = E steam = E mechanical = E electrical.

Regardless of the number of transformations to different forms of energy, the quantity of energy in the coal can theoretically never be greater nor less than the amount of electrical energy received. For simplicity it is assumed that the transformations are 100 per cent efficient. Since some of the energy is always dissipated in such forms as heat of friction or radiation, the actual amount of electrical energy obtained is less than 100 per cent.

Historically, the understanding of the principle of conservation of energy is recent. In 1798, Rumford (see RUMFORD, BENJAMIN THOMPSON) observed the large quantity of heat that appeared when a hole is bored in metal. At that time, men considered heat to be a fluid substance called caloric that passed from one body to another. Rumford surmised that the mechanical work, or energy, was converted to heat by friction. He proposed that heat was not a substance, but rather a type of energy that is transformed at the expense of another form of energy—in this

case, mechanical energy. It was left to J. P. Joule (see Joule, James Prescott), to develop in 1843 a mathematical relationship between the quantity of heat developed and the mechanical energy dissipated. A vanishing mechanical energy does not always become converted to heat. The mechanical energy of the wind can be converted to electrical energy by means of a windmill, which in turn can produce light or electromagnetic waves. These are all different forms of energy, but the quantity of energy always remains the same.

Mayer in 1842 and Helmholtz in 1847 (see Mayer, Julius Robert von; Helmholtz, Herman von) showed that when a gas does work in expanding, the internal energy of the gas decreases in proportion to the amount of work performed. This decrease in internal energy can be observed by the decrease in temperature of a gas on expansion. The work done (mechanical energy) in the compression of a gas increases the internal energy of the gas, which can be observed by the increase in temperature of the gas. These observations led to the first law of thermodynamics or a restatement of the law of conservation of energy—namely, that energy can neither be created or destroyed. See Conservation of Matter; Thermodynamics; Perpetual Motion; Energy.

CONSERVATION OF MATTER, LAW OF is an explanation of the continuous preservation of matter. It states that matter can neither be created nor destroyed. For example, when a quantity of water evaporates, its physical properties may change, but the weight of water vapor will exactly equal the original weight of water. The same will be true for a chemical reaction in which carbon and oxygen combine to form carbon dioxide. All the carbon may be consumed and its former physical and chemical properties destroyed, but the original weight of carbon will exactly equal the weight of combined carbon in carbon dioxide.

As late as 1770 it was thought that combustible matter contained a substance called phlogiston, which was liberated when a substance was burned. Lavoisier (see Lavoisier, Antoine Laurent) discredited this theory with a series of experiments on combustion. He showed that when a candle burns it loses weight, not because matter is destroyed, but because the matter changes form and escapes as a volatile gas. Through the work of Priestley (see Priestley, Joseph), who discovered oxygen, Lavoisier realized that the oxygen combined with the substances in the candle to form these products of combustion. If the candle and oxygen were weighed before burning, and the products of combustion weighed together afterward, it was found that the two weights were exactly equal. Thus, matter had not been destroyed, but changed into another form.

With the advent of the nuclear age, it became possible to observe the destruction and creation of matter in converting electrons into radiant energy, and radiant energy into electrons. It appears, therefore, that the law of conservation of matter does not hold in such cases. Yet if matter is defined in terms of energy the two become equivalent and the law holds true. Einstein (see Einstein, Albert) related matter and energy in his equation, $E = mc^2$, where E is the amount of energy liberated in the destruction of a mass m of matter and c is the velocity of light. Showing that matter can be annihilated in a nuclear reaction did not, therefore, disprove the original principles of conservation and conservation of matter. It merely demonstrated that each is a partial statement of a more fundamental doctrine: matter and energy are equivalent and neither can be destroyed without the equivalent form reappearing. See Conservation of Energy; Atomic Energy.

CONSERVATISM is a philosophy springing from a particular view of the nature of society, the state, and man. Conservatism rejects the contract idea of society and sees it as having grown by evolutionary processes that are scarcely knowable but nevertheless natural; all institutions and individuals within it are inevitably and intimately bound up with the past. The state and the government are seen not as mere contrivances of man for an *ad hoc* purpose but as part of a larger and divinely ordered system. It is therefore impossible and indeed wrong to attempt violent and sudden changes or revolutions. Man, in the conservative philosophy, is not seen primarily as a rational creature, or, for the great bulk of men, capable of becoming so. Rather, he is governed primarily by emotion and passion and therefore needs the brake of tradition on his sudden impulses. Equality, in a general sense, is seen as meaningless; the only true equality is that which relates to character and ability.

A philosophy exhibiting all or many of these characteristics could be found in almost any period of history—Greek, Roman, Medieval, Renaissance, or modern. However, certain great events in political development have sharpened and crystallized the meaning that is to be attached to conservatism. The first and perhaps the most important of these is the French Revolution; in fact Lord Hugh Cecil described conservatism as "a force called into activity by the French Revolution and operating against the tendencies that Revolution set up."

Edmund Burke (1729–97) was the most important conservative thinker of this period and may be regarded as the real founder of the doctrine as well as one of its most eloquent exponents. He saw society as organic in character, the complex product of centuries of evolution, and as a partnership not only between those living in the present but with the past and with those yet unborn. Burke recognized a religious basis for society not because he was more devout but rather because he was less confident of man's self dependence and the efficacy of reason. In his view the civil order was really a part of a more significant spiritual order and was therefore endowed with mystery and was to be treated with reverence. In particular Burke had a profound admiration for Great Britain's "unwritten constitution" as it was reconstructed after the revolution of 1688; it was, as he saw it, the product of years of growth, a true reflection of the society it served and therefore not to be lightly changed or cast aside.

Edmund Burke typified conservatism by his distrust of abstract principles. He attacked the doctrines of natural rights as put forth by Locke and Rousseau and argued that men have no natural right to political power: proposals to extend the franchise, for example, should be examined in the light of the character and temper of the people to whom the vote was to be given. He did agree that all men had a right to expect equal justice founded on the rule of law, not on a basis of abstract right but rather on the ground of the wisdom of experience expressed in convention. In his famous speech on conciliation with America he urged that all abstract principles referring to sovereignty and rights of the British parliament in America be confronted with the hard facts of the nature of the society that had grown up in America, the ideas of the people regarding government, religion, manners, customs, and remoteness from their country of origin.

Neither Burke nor the conservative philosophy that has developed from his writings can be considered as an inveterate enemy of all change; in fact, conservatism sees change as a part of growth and the process of renewal. It does hold that the onus of proof is on the proponent of a change, and that the grievance must be clearly specified and proved and be of sufficient magnitude to warrant innovation. The remedy proposed must be reasonable and not of such a nature as to damage the whole social fabric. Burke saw the French Revolution as an event that would destroy the fabric but put nothing substantial in its place; in his pamphlet "Reflections on the French Revolution" he predicted the Reign of Terror, which had not begun when his work was issued, and also the rise of

a despotism that did come about in the Napoleonic period.

Two other events which, in England, produced a redefinition and a reorientation of the conservative philosophy are the extension of the franchise through the Reform Act of 1832 and the growth of a large wage-earner class as a result of the Industrial Revolution. The most important spokesman for these changes in England were Robert Peel and Benjamin Disraeli. Up to the time of Peel conservatism had been largely a philosophy for the aristocracy. Peel transformed it into a middle class creed. On assuming office in 1834 he issued an "Address to the Electors of Tamsworth," which proclaimed acceptance of the Reform Act but reaffirmed loyalty to tradition and ancient institutions. The speech was, in effect, a new charter for conservatism. Disraeli, while often criticizing Peel's action, carried the process one step further when his government added nearly a million voters to the electorate in 1867 by passage of the Electoral Reform Bill. Disraeli formulated the ideas by which conservatism justified numerical democracy —a principle that Burke abhorred.

Conservative as used to designate a particular group in the British House of Commons first came into general use in the decade following 1841 and was applied to the ministry headed by Sir Robert Peel. The party achieved its greatest success of the nineteenth century under Disraeli in the period 1874–80. In 1906 the party split over the question of tariff reform and remained in opposition until it joined in the Asquith coalition of 1915. From 1922 to 1945 the party was either in power or was the dominant force in a coalition except for periods of Labour rule, 1923–24 and 1929–31. For the first half of the decade beginning in 1945 the Conservatives lost to Labour but in 1951 won by a narrow margin.

The new world as represented by the United States and Canada has contributed very little to the philosophy or theory of conservatism and had produced almost no statements to illuminate the doctrine in particular situations; this is not to say, however, that conservatism has not been a potent force in the history of the two countries. One exception to this generalization in so far as the United States is concerned is found in conservatism in the South prior to the Civil War. John Randolph and John Calhoun expressed the dominant conservatism of the South in literature that has survived. A second exception is the writings of President John Adams in such works as *Dangers of American Liberty* and *Defense of the Constitutions of Government of the United States of America.*

Conservatism as resistance to change, belief in a religious basis for society, and the organic nature of the state has found plenty of champions in American literature but has never for any long period formed the main basis for either the Republican or the Democratic party. In a general way the early Federalist party claimed to be the defender of order while the Jeffersonians looked upon themselves as the apostles of natural rights and liberty; however, the most important issue dividing them shortly became the practical question of the construction and application of the Constitution. The Federalists disappeared as a national party and the Republicans split into two wings, one led by Jackson under the name of Democrats and the other led by Adams and Clay and called National Republicans. This latter group later became Whigs but was composed of so many diverse elements that no philosophic table could describe them. The reopening of the slavery question in the 1850s broke up the old Whig Party and produced the Republican and Democratic parties.

As a generalization, the Republican party has been closer to the conservative philosophy than the Democrats; this became evident before the turn of the century and was accentuated particularly by the Democratic sponsorship of the New Deal under the presidency of Franklin D. Roosevelt.

The parties in Canada, as in the United States, have taken their distinguishing features from particular issues rather than from basic beliefs about man, society, or the state. The government immediately after confederation in 1867 was conservative in name and held power, with the exception of the years 1874–78, until 1896. It was by no means conservative in its actions; the newness of the country demanded a daring government and the Conservatives were criticized by the Liberals for the boldness with which they pursued some policies, especially the building of a transcontinental railway. The Liberals, led by Sir Wilfred Laurier, came to power in 1896 and held office until 1911. The issue on which they were defeated, that of reciprocity with the United States, points up one difference between the parties. The Conservatives won the election largely on the ground that reciprocity would damage the relationship with Great Britain and hence established their reputation as a traditionalist party—a point of view that they have maintained with reasonable consistency throughout their history. The Conservatives suffered a decisive defeat in 1921 and the Liberals have been in power ever since except for four years between 1930 and 1935.

While conservatism as a philosophy has not been particularly important in party grouping in Canada the basic national outlook is well described by that word. Canada is the only country in the Western Hemisphere without a revolutionary tradition; the only new country that has maintained a continuous and official connection with an older and parent society. M. S. Donnelly

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CONSERVATORY. See Greenhouse.

CONSERVATORY, a school of systematic musical instruction. Conservatories were originally benevolent establishments for music instruction attached to hospitals and other charitable or religious institutions, the earliest known being the Conservatorio de Santa Maria di Loretto at Naples, established in 1537. In France the École Royale de Chant et de Declamation was founded in 1784 for the purpose of training operatic singers; after the French Revolution it was reorganized in 1795 as the celebrated Conservatoire de Musique. In England the Royal Academy of Music, London, was founded in 1822. The Conservatorium at Leipzig was founded in 1842 under the auspices of Mendelssohn. Many conservatories were established in the United States, one of the leading institutions being the National Conservatory of Music of America, founded in New York in 1885, which was directed for a time by Antonin Dvořák.

CONSETT, urban district, N England, in N Durham, 12 miles NW of Durham. Consett is an industrial and residential center mainly concerned with steel manufacture and coal mining. Other industries are the manufacture of textiles and chemicals. Included in the urban district of Consett are the towns of Benfieldside and Leadgate. Pop. (1951) 39,456.

CONSHOHOCKEN, borough, SE Pennsylvania, in Montgomery County, on the Schuylkill River, on the Pennsylvania and the Reading railroads; 12 miles NW of Philadelphia. Manufacturing in Conshohocken includes steel, rubber products, metal products, boilers, and textiles. Pop. (1955) about 11,000.

CONSIDÉRANT, VICTOR PROSPER, 1808–93, French socialist, was born in Salins, Jura. He entered the French army as an engineer, but resigned his commission in 1831 in order to promote the socialist doctrines of Charles Fourier. On the death of Fourier, 1837, Considérant became the head of his school and undertook the management of *La Phalange*,

a magazine devoted to "Fourierism." In 1848 he was elected to the National Assembly, but in the following year was accused of high treason and was compelled to leave France. He went to the United States where he founded the short-lived La Réunion community, near San Antonio, Tex. Considérant returned to France in 1869. Among his works are: *Destinée sociale* (1834–38) and *Principes du socialisme* (1847).

CONSIDERATION is an act or forbearance, or the promise thereof, which is offered by one party to an agreement, and accepted by the other, as an inducement to that other's act or promise. Every contract not under seal requires a consideration to support it. It is not essential that the consideration shall flow direct from one party to the other; there must, however, be some benefit flowing to the obligor which he would not have received but for the contract. It is in effect the price bargained and paid for a promise. Consideration may be sufficient if the act to be performed is not obligatory, since it is a legal detriment irrespective of whether it is an actual detriment or loss to him.

Sufficient consideration also exists if the promisee foregoes some advantage or benefit or parts with a right which he might otherwise exert. The surrender of a claim against an insolvent person, if such person is living, is a sufficient consideration to support the promise of a third party. The relinquishment of an invalid claim or forbearance from suit without any request to forbear, or circumstances from which an agreement to forbear may be implied is not a consideration which will support a promise. Generally past consideration is insufficient to support a promise.

Though in some jurisdictions a moral obligation is regarded a sufficient consideration, it is usually denied. However, a moral obligation insufficient to support an executory promise will support an executed transaction between natural persons acting in their own behalf. Where the moral obligation arises from the receipt of a material or pecuniary benefit it will not support a new promise to supplement a contract already performed or still enforceable. On the other hand, where the legal duty has become unenforceable by operation of law, a subsequent promise to perform the duty is binding. There is a conflict of authority as to the sufficiency of consideration in the case of a voluntary payment of the debt of another or the making of improvements of property without the owner's request.

To constitute a sufficient consideration to support another promise, the promise must be binding. The promises must be concurrent and obligatory on both at the same time. It must be possible of performance and definite to be sufficient consideration for a counterpromise. Although at common law contracts not under seal had to be supported by sufficient consideration, if not within the statute of frauds they did not have to recite consideration since that could be proved by parol (oral) evidence or may be inferred from the terms and obvious import of the contract. Consideration is not insufficient merely because it is inadequate. It need not be a thing of pecuniary value. Since the parties are deemed the best judges of the bargains entered into, the relative economic value of the consideration is immaterial. See CONTRACT.

CONSIGNMENT is the transfer of goods from the owner to an agent who undertakes to sell them at the best advantage. The owner is the consignor and the agent is the consignee. The title to the goods remains with the consignor, and the consignee must pay for them only if the goods are sold. The consignee usually charges a fixed commission which he deducts before remitting the proceeds. This method of selling is often employed when large risks are involved, such as in produce marketing.

CONSISTORY, properly a place of assembly, originally applied to the privy council or cabinet of the Roman emperor, now a church tribunal, also a certain kind of meeting in Freemasonry. In the Roman Catholic church the Papal Consistory is a meeting of the College of Cardinals over which the pope presides. In the Lutheran, Presbyterian, and Anglican churches the consistory is an ecclesiastical tribunal which has jurisdiction over church matters. In Freemasonry the consistory is a meeting of members of the 32nd degree, or the Sublime Princes of the Royal Secret in the Ancient and Accepted Scottish Rite.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., one of the leading electric power producers in the United States. It supplies electricity, gas, and steam in the New York City area. Its original predecessor was the New York Gas Light Company organized in 1823, the second gas company to be formed in the United States. The electric power part of its present business was started in 1882 by another predecessor firm, the Edison Electric Illuminating Company of New York, which began to supply electricity from Thomas A. Edison's Pearl Street station. Seven gas companies were merged in 1884 to form the Consolidated Gas Company of New York. After a series of other mergers the present company was formed in 1936 following a merger of the principal electrical subsidiary. In 1956 the firm's generating equipment consisted of nine plants using coal, natural gas, and oil as fuels. Consolidated Edison Company then planned to build a 140,000-kilowatt nuclear power plant at Buchanan, N. Y., to begin operation in 1960. Besides supplying electric power in the New York City area, the company also supplied natural gas and mixed gas, the latter being produced at two plants from coke and natural gas and oil. In 1956, the firm had total assets of more than $1.8 billion.

CONSOLS is the contracted name for Consolidated Annuities, a form of funded debt of the British government begun in 1751. Prior to that year great confusion had been caused in financial circles by the issue of different kinds of debt obligations at varying rates of interest. Between 1750 and 1757 several acts were passed by parliament consolidating these into joint stocks of annuities, the greater part of which bore interest at 3 per cent, although some were at a higher rate. The unique feature of the consols was that they were indefinite in term and could be redeemed at any time at the option of the government. For many years the British government offered these annuities at various prices although the interest rate remained at 3 per cent. A conversion operation in 1888 reduced the rate to 2¾ per cent and provided for a further reduction to 2½ per cent after 14 years. Since World War I, consols have formed a steadily declining portion of the British national debt as the debt itself has increased.

CONSONANT. See ALPHABET; PHONETICS.

CONSORT, a husband or wife, especially of a reigning king or queen. In Great Britain a queen consort, the wife of a reigning king, is legally the subject of her husband, though she has special rights and privileges. The legal position of the husband of a queen ruling in her own right has varied. Philip II of Spain, who married Mary Tudor in 1554, was by law excluded from the government. William III, called to the throne in 1689 as joint sovereign with his wife Mary, was not a consort in this sense. Prince George of Denmark, husband of Queen Anne, was a naturalized subject by act of parliament, with no other legal position. Prince Albert, the husband of Queen Victoria, was given precedence immediately after the queen, and in 1857 received the title Prince Consort. Philip, the Duke of Edinburgh, was given precedence after the queen upon the accession of Elizabeth II in 1952.

CONSPIRACY is an agreement between two or more parties to do an unlawful thing in an unlawful manner. The theory of conspiracy rests on a preconceived plan to work some public or private wrong or

injury by concerted action originating in a combination, either carried out in joint enterprise, or at least pursuant to joint agreement. The crime existed at common law but those states which do not recognize common law offenses and the federal courts can punish only such combinations as are made punishable by statute. The elements essential to the crime are:

1. A combination of two or more persons. 2. A real agreement, combination or confederation with a common design; mere passive cognizance of the crime or unlawful act to be committed or mere acquiescence is not sufficient. 3. Existence of an unlawful purpose or act to be accomplished or a lawful purpose to be accomplished by unlawful means.

As in other offenses criminal intent is a necessary element. Intent, however, will ordinarily be inferred from the nature of the act. Although at common law the criminal offense of conspiracy is complete as soon as the confederacy or combination is formed, the rule has been modified in many jurisdictions by statutes which require that there be both an agreement and an overt act to effect the object of the agreement. Any person who takes part in the conspiracy, whether as a party to the agreement or by wilfully doing an act in furtherance of the common design, is liable as a conspirator. One may be liable as a conspirator even though he is incapable of committing a crime which is the purpose of the conspiracy. Among the indictable combinations are agreements: to commit crime, to injure reputation, to deceive the public, to commit an offense against the United States, to defraud the United States, to injure or interfere with civil rights, and to obstruct justice.

Although strictly there is no such thing as a civil action for conspiracy, an action will lie for damages caused by the acts committed pursuant to a formed conspiracy, rather than by the conspiracy itself. An act lawful if done by an individual may be the subject of civil conspiracy when done in concert provided that there be a direct intention that injury result from the performance of such act or when its natural consequence is the prejudice of the public or the oppression of individuals. Intention to injure, however, is not an indispensable element of the wrong. Anyone capable of being sued who takes part in a conspiracy may be held to answer in damages. Such actionable conspiracies are a combination to induce breach of contract, to make a false representation as to the solvency of a person in order to induce credit and the fraudulent use of legal proceedings. Exemplary damages may be awarded in an action for conspiracy only against persons actuated by malicious motives.

BENJAMIN WERNE

CONSPIRACY, POLITICAL, a secret agreement between two or more individuals to pursue certain political objectives by other than constitutional means, including violence and revolution; also a concerted action conducted for the purpose of treason or sedition, to overthrow the existing government of the country, or to seize the political power by unlawful and unconstitutional means.

In totalitarian or dictatorial countries where there are no legal means to bring about a change in the form or personnel of the government, political conspiracy may be the only instrument available to those dissatisfied with the regime. Conspiracies are thus frequently organized in the name of liberty and democracy as, for example, the conspiracies in Nazi Germany, Fascist Italy, or the Soviet Union, and the conspiracy against the Perón regime in Argentina. In a democratic country where there are available legal means for changing the composition or form of the government, such as elections, constitutional amendment, and so on, political conspiracy is usually the instrument of a totalitarian, antidemocratic minority which would otherwise be defeated by a majority at the polls. Political conspiracies are at times supported or directed by a foreign state which hopes to exploit such activities to weaken, influence, or conquer the country against which such conspiracy is directed.

Political conspiracies are known to have existed in every period of history. Communist movements in the United States and other Western countries represent an international conspiracy directed from Moscow.

CONSTABLE, HENRY, 1562–1613, English poet, was born in Newark, Nottinghamshire. He was graduated from Cambridge University and later became a Roman Catholic. He lived outside England for most of his life, being employed as an English secret agent in Paris, 1584–85, and later as a papal legate to Scotland. He was politically active in Paris as a promoter of the cause of Catholicism. When he ventured to England in 1604, he was accused of treason against Queen Elizabeth and was imprisoned in the Tower of London. Upon his release he went to Belgium to live. Constable played an important role in the development of the English sonnet; indeed, his *Diana, the praises of his Mistress in certain sweet sonnets, by H. C.* (1592), consisted of 23 poems which were among the first examples of English sonnets in the Italian form. Constable's *Shepheardes Song of Venus and Adonis* (1600) was much imitated by his contemporaries. See SONNET.

CONSTABLE, JOHN, 1776–1837, English landscape painter, was born in Suffolk. The son of a wealthy miller, he followed his father's profession for several years and painted only in his spare time; but finally in 1799 he persuaded his family to permit him to enter the Royal Academy of Art, London, where he devoted himself to portraiture and historical subjects, copying from old masters in order to learn technique. He developed great proficiency, but had little success in selling his works. In 1816 he married Maria Bickness; through a legacy of £20,000 left to him in 1828 by her father, Constable was finally freed from financial worry. Thereafter he could devote his full attention to the kind of painting he wanted to do.

Constable's art matured slowly. In about 1811 he began to paint in the free, direct manner for which he is best known. His style developed over the years into a personal and very English expression, almost entirely free of the continental traditions. He was one of the first to choose simple pastoral scenes as fit subject matter, and was probably the first to abandon the brown grounding tints of the Dutch landscape school: Constable preferred nature's own colors. His green grass, misty blue skies, and yellow hay stacks were a radical departure from the accepted mannerist landscapes of the time; some critics have even called him the true founder of the impressionistic Barbizon school. Perhaps, too, a foreshadowing of Claude Monet can be seen in such paintings as

***Salisbury Cathedral from the Meadows*, one of Constable's best known paintings, illustrates the excellent style and use of naturalistic colors that gave him his reputation.**

NATL. GALLERY OF ART

Salisbury Cathedral from the Meadows (1831). Among his other important works are *Leaping Horse* (1825), *Dedham Vale* (1828), and *The Valley Farm* (1835). Although his talent was recognized by the Royal Academy —he was elected a member in 1829—Constable's painting did not bring him a livelihood, and during his lifetime he was accorded little if any public acceptance. Later, however, his work assumed its true place in the sequence of English art, and Constable came to be regarded as one of England's foremost painters.

CONSTABLE, the title of a feudal official who was originally of high military rank, now generally an officer of the peace. The constable or *connétable* of France rose gradually in importance until he became *ex officio* the commander in chief of the army, the highest judge in military offenses and in questions of chivalry and honor, and the supreme arbitrator in tilts, tournaments, and martial displays. The office was suppressed by Louis XIII in 1626. Under Napoleon, the constable was the fifth of the great dignitaries of the empire. The office was again abolished on the restoration of the Bourbons.

The high constable of England appears shortly after the Conquest as the seventh great officer of the crown. The office went by inheritance to the earls of Hereford and Essex, and afterward in the line of Stafford. When Edward Stafford, duke of Buckingham, was attainted in 1521, the office became forfeit, and has never since been granted except for a special ceremony of state. But meanwhile other officers, known as chief and petty constables, appeared. The Statute of Winchester (1285) provided for the appointment of a chief or high constable in every hundred and for a petty constable to replace the bailiff in the villages. These officials remained the executive legal officers in the English counties until the adoption of the County Police Acts of 1839 and 1840; an act of 1856 made the petty constable a part of the county police system, and later the office of high constable was abolished.

In the United States the constable dates from early colonial times. At first the official usually had important powers, although his duties varied from community to community; he made arrests, carried out searches, executed processes, and often was tax collector, overseer of the roads, and sometimes served as petty judge. For a long time Philadelphia and New York had high constables. In the larger towns the office is now generally filled by the chief of police, but in the smaller towns and villages it is still often found, the functions being those of a conservator of the peace but often with various other duties. See POLICE.

CONSTANCE. See KONSTANZ.

CONSTANCE, COUNCIL OF. See COUNCIL OF CONSTANCE.

CONSTANCE, LAKE OF, also Lake Constance, or Bodensee, a large lake on the borders of S Germany, NE Switzerland, and W Austria. The lake has an area of 208 square miles, is more than 40 miles long, and has a maximum width of 9 miles. It is located at the northern foot of the Alps at a 1300-foot elevation. The Lake of Constance is formed by an expansion of the Rhine River and has three local names. The northern of the two westerly arms is called the Überlinger See, the southern the Untersee; the main body of the lake is known as the Obersee. The lake is famous for its beauty and attracts many tourists. Major towns on the lake include Konstanz (Constance), Friedrichshafen, and Lindau, Germany; Bregenz, Austria; and Rorschach, Switzerland. Ancient lake dwellings discovered in the shallow waters have been partially restored. The Romans called the lake *Lacus Brigantinus*.

Lake Constance forms part of the German-Austrian-Swiss border. This is a view of the Bavarian port of Lindau, which lies near the southeastern extremity of the lake. BLACK STAR

CONSTANS I, Flavius Julius, 321?–350, Roman emperor, youngest son of Constantine the Great and Fausta. In 333 he was made nominal governor of Illyricum, Italy, and Africa; at his father's death, 337, he received those provinces as his share of the empire, which he ruled jointly with his two brothers. In 340 he resisted the invasion of his brother, who was killed, and became sole Emperor of the West. He was assassinated by soldiers of the usurper Magnentius.

CONSTANS II, Flavius Heraclius, 630–68, Byzantine emperor, son of Constantine III, succeeded to the throne in 641. In 648 he issued the *Typus*, forbidding religious discussion; this edict was supposedly aimed at securing religious peace but it caused a dispute with Pope Martin I. Constans campaigned in Italy, 662, in the last attempt to re-establish Rome as the center of empire, and later settled in Syracuse, where he was assassinated.

CONSTANT, BENJAMIN, 1845–1902, French painter, was born in Paris and studied at the École des Beaux-Arts and under Alexandre Cabanel. Constant's first picture, *Hamlet et le roi*, exhibited at the Salon in 1869, established his reputation as an outstanding painter. Strongly influenced by a visit to Morocco, his *Samson et Delilah* (1871), *Prisonniers Marocains* (1875), and *Entrée de Mahomet II à Constantinople* (1878) placed him in the front rank of the French masters. After 1880 he painted murals and numerous portraits, including *Queen Victoria*, *Queen Alexandra*, *Leconte de Lisle*, *Jusserand*, and *Mons Fils André*. His mural *Justinian in Council* is in the Metropolitan Museum of Art, New York.

CONSTANŢA, Turkish Küstenje, ancient Constantiana, city, ESE Rumania, in Dobruja, capital of the province of Constanţa, on the Black Sea, 125 miles E of Bucharest. Constanta is an important commercial center and the principal Rumanian port on the Black Sea. It is also a resort center, railroad terminus, and military base. Industries in the city include the manufacture of construction materials, wood products, textiles, leather, and food products. Constanţa has good port facilities, including grain elevators and oil storage tanks. A pipeline connects the port with the Ploeşti oilfield. Petroleum, lumber, and agricultural produce are important exports. Features of interest in the city include a naval academy, mosques, churches, synagogues, and museums. The city was founded by Constantine I in the fourth century near the site of the ancient Greek settlement of Tomi. During the Middle Ages Constanţa declined to a mere fishing village. From 1413 to 1878 it was under Turkish rule, but in the latter year came under Rumanian control. Pop. about 79,000.

CONSTANT DE REBECQUE, BENJAMIN, 1767–1830, French writer and political figure, was born in Lausanne, Switzerland, and educated at Oxford, Erlangen, and Edinburgh. On a visit to Paris in 1787 he met Madame de Charrière, 20 years his senior; she became his mistress and remained so until 1796, when she was replaced by Madame de Staël, whose protégé Constant had become in 1794. This relationship, frequently punctuated by stormy interludes, lasted until 1809. Constant entered the

Tribunate in 1799 and served until Napoleon removed him in 1802. Later in the same year, Madame de Staël was banished and Constant followed her into exile. Returning in 1814, he held office under Napoleon but was exiled in 1815 by Louis XVIII. In 1816 he returned to France again and became a pamphleteer. After 1819 he was a member of the Chamber of Deputies, advocating a constitutional monarchy and civil liberties. He wrote *Adolphe* (1816, Eng. tr. 1908), *Le Journal intime* (1887–89), and *Le Cahier rouge* (1907).

CONSTANTINA, city, SW Spain, in the province of Seville, in the foothills of the Sierra Morena; 38 miles NNE of Seville. Constantina has flour and sawmills, distilleries, and shoe and soap factories. In the surrounding area are copper, coal, and lead deposits; olives, grapes, livestock, cork, and lumber are produced. Pop. about 15,000.

CONSTANTINE, died 715, pope in 708–15, was born in Syria.

CONSTANTINE III, 612?–641, Byzantine emperor, son of the emperor Heraclius. He became co-emperor with his half-brother Heracleonus, but died shortly afterward, probably having been poisoned by his stepmother.

CONSTANTINE IV, known as Pogonatus, 648–85, Byzantine emperor, son of Constans II. He became emperor in 668. He successfully defended Constantinople against the Moslems, 672–77, by using Greek fire. In 679 he was defeated by the Bulgars, who established a kingdom within his realm. He called the sixth ecumenical council at Constantinople in 680, in an attempt to restore peace among various religious factions. See Greek Fire.

CONSTANTINE V, called Copronymus, 719–75, Byzantine emperor, was born in Constantinople. An able military leader, he succeeded his father in 741 and put down a revolt led by his brother-in-law, Artavasdus, 743; he later defeated the Arabs, Slavs, and Bulgars. He did much to establish Constantinople as the Eastern center of trade and commerce, and was responsible for many civic improvements. An avowed foe of the Roman hierarchy and an iconoclast, he issued a decree forbidding the worship of images and carried on a vigorous campaign against monasteries.

CONSTANTINE VI, 771–?797, Byzantine emperor, was the son of Leo IV and Irene. When at the age of 10 Constantine succeeded his father, his mother ruled as regent. Refusing to give up the throne when Constantine came of age, Irene had her son arrested and blinded, and it is probable, though not certain, that he died at that time.

CONSTANTINE VII, called Porphyrogenitus, 905–59, Byzantine emperor, the only son of Leo VI. His surname means "born in the purple," and was given him because he was born in the purple chamber in which the empresses awaited their confinements. Although he was nominal ruler from 911 to 959, he was forced to live in retirement until 945 by Romanus Lecapenus, his stepfather. A painter, writer, and patron of the arts, Constantine was known for his humane legislation and efficient administration. He wrote several books, the best known being *De administrando imperio*, written as a guide for his son, and *De ceremoniis aulae Byzantinae*, a description of Eastern court customs. After a victorious campaign against the Arabs he was poisoned by his son Romanus.

CONSTANTINE VIII, 960?–1028, Byzantine emperor, son of Romanus II. He ruled jointly with his brother Basil II until 1025 when, upon his brother's death, he became sole ruler. He was little interested in affairs of state and permitted his authority to fall into the hands of courtiers.

CONSTANTINE IX, known as Constantine Monomachus (Constantine who fights alone), 1000?–55, a soldier who married the Byzantine Empress Zoë in 1042 and ruled with her and her sister Theodora. In 1050 Zoë died, and he continued to rule with Theodora as empress. He spent tremendous sums to erect lavish buildings and monuments, but neglected military affairs and disbanded most of the army. As a result he was unable to meet the threats of the Normans in Lombardy, and Italy was lost to the Byzantine Empire.

CONSTANTINE X, also known as Constantine X Ducas, 1007?–67, Byzantine emperor, who, having been a capable administrator under Isaac I, was chosen to succeed him in 1059. He was, however, totally inefficient as a ruler, a fact which very nearly brought about the destruction of his empire, as threatened by the Turks, Armenians, and Magyars. The year before his death the Normans captured Bari, the chief city of southern Italy, and broke the Byzantine hold on its few remaining western provinces.

CONSTANTINE XI, Paleologus, also known as Constantine Dragases, 1404–53, last Byzantine emperor. He made a heroic attempt to save the crumbling Byzantine Empire, and vainly called for union between the Roman and Eastern churches. With 8000 Venetian, Genoese, and Greek volunteers, he defended Constantinople for two months against an army of 150,000 led by Sultan Mohammed II. He was killed with the last of his men in a battle at the gates of the city.

CONSTANTINE I, 1868–1923, king of the Hellenes, was born in Athens, the eldest son of King George and Olga, niece of Nicholas I of Russia, and was educated by German tutors for a military career. In 1889 he married Princess Sophia, sister of Wilhelm II of Germany. He commanded the Greek forces in the Turkish War of 1897 and was severely criticized for the Greek failure, but in the Balkan War of 1912–13 won warm praise and was acclaimed a national hero. Upon the assassination of his father in 1913, Constantine ascended the throne and by his continued victories over the Turks and Bulgarians, and by the treaties of London and Bucharest, greatly enlarged the area of his sovereignty. Because of his alleged German sympathies during World War I he was forced to abdicate and was exiled to Switzerland. Following the death of his second son, Alexander, who had succeeded him on the Greek throne, Constantine was recalled in 1920. He entered at once on a campaign of aggression against the Turkish nationalists in Asia Minor, but was defeated by the Turks in 1922. Civil and military revolts caused his second abdication in 1922. He retired to Sicily, where he died.

CONSTANTINE I or **CONSTANTINE THE GREAT,** full name Flavius Valerius Aurelius Constantinus, 274?–337, Roman emperor, son of the Emperor Constantius I (Chlorus) and Helena, was born in Naissus, Upper Moesia (now Yugoslavia). When his father, who had ruled jointly with Galerius and Maximianus, was killed in battle at Eboracum (now York), 306, Constantine was proclaimed Caesar Augustus by the army. Galerius was forced to recognize the title; and Constantine's position was further consolidated by his marriage to Fausta, daughter of Maximianus. In 310 Maximianus attempted to oust Constantine and the young emperor had him put to death; in 312 Maxentius, son of Maximianus, was defeated and killed in a battle near Rome. It was just before this battle that Constantine was supposed to have seen in the skies a flaming cross bearing the legend *in hoc signo vinces* (in this sign conquer)—an omen which, followed by his victory over the pagan Maxentius, purportedly led to his embracing, or at least countenancing, Christianity. Legends about the supposed miracle vary, but after that battle Constantine did adopt the monogram Chi-Ro (initials in Greek of the name of Jesus Christ) as a decoration for his battle standard. In 311 Galerius died, opening the way for Constantine to become co-emperor with Licinius, who had been recognized by Galerius as ruler of the eastern portion of the empire, in Asia Minor. In 324, after being

ART INST. OF CHICAGO

Constantine the Great, although often ruthless in pursuing his goals, was one of the Roman Empire's ablest rulers. A protector of Christianity, he was a deathbed convert.

defeated in battle at Chrysopolis, Licinius was murdered at Constantine's instigation, and Constantine became sole ruler of the Roman Empire. In 325 he called the Council of Nicaea and proclaimed Christianity the official state religion; in 330 he dedicated Constantinople (now Istanbul), as the seat of empire, to the Virgin Mary. His choice of Byzantium for the founding of his capital city was probably dictated by the fact that Rome was still predominantly pagan; as he did not wish to cause open conflict when he declared for Christianity, the wiser choice was to move the capital.

Although his reign was beset with political and religious intrigue and some reprehensible murders—such as those of his wife, Fausta, and his son, Crispus—Constantine was undoubtedly one of the ablest rulers of the Roman Empire. He was a capable administrator and a brilliant militarist whose aim was the unification of Roman power, from Byzantium to Britain. Toward this end he abolished the military function of the praetorian guard and removed the regulation of military outposts from civil governors, thus lessening the danger of usurpation of power; the army forces were controlled by *duces* (dukes), and civil affairs by a newly created aristocracy, *comites* (counts). He enforced a rigid code of taxation and originated the *collatio lustralis*, a levy on business profits; he solidified the organization of society into strict hereditary segments, making it virtually impossible for the individual to leave the class into which he was born; he also imposed strict penalties upon offenses against the official morality. His legislation had far-reaching effects upon the legal codes of future generations. Although he protected Christianity, and was in fact through his legislation probably responsible for the development of the temporal power of the church, he did not officially become a Christian until his deathbed conversion. F. D.

CONSTANTINE II, full name Flavius Claudius Constantinus, 317–40, Roman emperor, son of Constantine the Great, was born at Arles. Emperor from 337 to 340 he governed Gaul, Britain, Spain, and part of Africa. He invaded the territory of his brother, Constans, but was killed in battle.

CONSTANTINE, Flavius Claudius, died 411, a Roman soldier who in 407, during the reign of Honorius, was chosen emperor by his comrades. He marched into Gaul, securing nearly the whole of that country, and in 408 was recognized as co-emperor by Honorius, who desired to gain his aid against the Goths. Constantine thereupon entered Italy with a strong army, intending to depose Honorius, but was stopped by the rebellion of his own general, Gerontius. He was subsequently defeated by the legions of Honorius, and was executed.

CONSTANTINE, department, N Algeria, bounded by the Mediterranean Sea on the N, the department of Bône on the E, the territory of Touggourt on the S, and the department of Algiers on the W; area 23,237 sq. mi.; pop. (1954) 2,688,973. The department is largely composed of mountain ranges and plateaus which form part of the eastern Atlas Mountains. The highest peak in Constantine is Djebel Chélia (7638 ft.) in the Aurès massif. Bordering the Mediterranean is the Tell coastal plain; other lowlands occur in the southern section of the department on the northern fringe of the Sahara. The climate is Mediterranean in type, with hot summers and mild winters. More extreme conditions are experienced in the higher mountains. Precipitation is generally light, averaging more than 25 inches a year in the north

TWA AIRLINE

One of the best preserved of ancient Roman edifices is the Arch of Constantine, built in the fourth century.

and decreasing southward. Agriculture is the main occupation and wheat, olives, grapes, fruits, cork, and vegetables are the principal crops. Minerals include iron, zinc, mercury, copper, manganese, and antimony. Major cities in the department are Constantine, the capital, Philippeville, and Bougie. The department was established in 1848. See ALGERIA.

CONSTANTINE, ancient Cirta, NE Algeria, capital of the department of Constantine, about 210 miles ESE of Algiers. Constantine is an important commercial and industrial center in a region mainly noted for grain. The city has rail and road connections with Philippeville, the port of Constantine, and other northern centers. Constantine has a picturesque, but cramped, site on a mountain shelf more than 2000 feet above sea level. On three sides is a deep gorge formed by the Rhumel and one of its tributaries. Major industries in Constantine include the manufacture of flour, textiles, leather, machinery, construction materials, tobacco, and food products; there is important trade in grain, hides and skins, wool, and esparto grass. Tourist attractions in Constantine include natural bridges over the Rhumel, an ancient citadel, and a wealth of archaeological remains, including many Roman relics. The city is of ancient foundation and was the most important center in Numidia. It later became a Roman colony and was rebuilt by Constantine I after having been destroyed by war in 311. During the medieval period Constantine was under the control of various Moslem dynasties and came under Turkish rule in the eighteenth century. It was captured by the French in 1837. Pop. (1954) 116,706.

CONSTANTINOPLE. See ISTANBUL.

CONSTANTINOPLE, COUNCILS OF. See COUNCILS OF CONSTANTINOPLE.

CONSTANTIUS I, known as Chlorus (the pale), 250?–306, Roman emperor. Under the reorganization of the Roman Empire by Diocletian, Constantius governed Gaul, Britain, and Spain. When Diocletian abdicated, 305, the power in the west was left to Constantius, in the east to Galerius. While on an expedition against the Picts, Constantius died at Eboracum (York).

CONSTANTIUS II, Flavius Julius, 317–61, Roman emperor, son of Constantine the Great, was born in Sirmium. With his two brothers he succeeded his father in 337 and was made ruler of the Eastern provinces. He waged war with the Persians and suffered a bitter defeat at their hands in 348. In 353 he defeated Magnentius, the murderer of his brother Constans, at Mursa and became master of the whole empire. He subsequently sent his cousin Julian to Gaul against the Alemanni and Franks. Julian repulsed them so successfully that in 360 he was proclaimed emperor. Constantius thereupon marched against him but died on the way.

CONSTANTIUS III, died 421, Roman emperor, was born in Illyria. He ruled western Europe after successful campaigns in Gaul and Spain. After his marriage to Galla Placidia, sister of Emperor Honorius, in 417, he became co-emperor in 421.

CONSTELLATION, a recognized group of fixed stars. Modern astronomers divide the sphere of the sky into 88 areas, and all celestial objects present within any particular area are members of a constellation. In general, each constellation encloses a pattern which by coincidence happens to be set apart from neighboring groups by regions of the sky less populated by bright stars. The constellations are not, however, identical with these configurations. As an example, the familiar configuration of north circumpolar stars, known in the United States as the Big Dipper, is made up of the seven brightest stars in a much larger area of the sky which is the constellation Ursa Major, the Big Bear (see CIRCUMPOLAR STAR; DIPPER). Similarly, the stars that comprise the configuration known as the Northern Cross are the brightest ones in the constellation Cygnus, the Swan. Other conspicuous configurations are the Sickle in Leo, the "W" in Cassiopeia, and the Great Square in Pegasus.

Outlines of the brighter configurations bear a marked resemblance in some cases to the namesakes of the constellations of which they are a part: for example, Orion, the Hunter; Scorpius, the Scorpion; and Sagitta, the Arrow. Persons of artistic bent have whiled away many pleasurable hours in attempts to fit classic constellation figures to the other more haphazard star patterns, but with little success. An innate difficulty in such a project is that the constellations were originally named by ancient peoples in honor of gods and goddesses (Cepheus, Andromeda), out of respect for famous heroes (Hercules, Orion), and even for animals (Leo, Canis Major, Cetus).

The practice of giving names to various regions of the sky had its origin with the earliest civilizations in Mesopotamia, Chaldea, Phoenicia, and Egypt. It was the natural outcome of the awe and the reverence in which these peoples held the heavens. The admixture of astronomy, religion, and folklore that is preserved in the Greek and Roman myths represents the culture of ages long past and its gradual transformation through uncounted retellings of many generations. The culture of the early peoples of the Orient and the New World abounds also in similar but less well-known fables related to the sky.

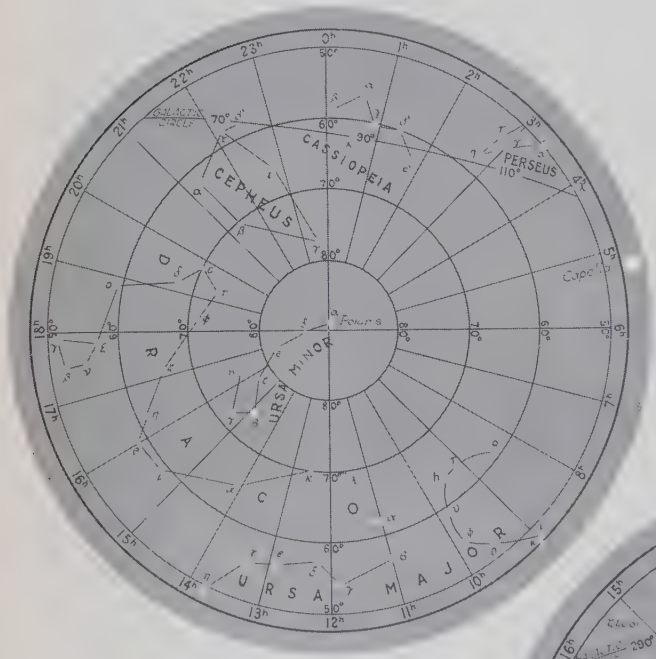
The Zodiac. Among the most ancient constellations recognized today are those located in the zodiac (see ZODIAC), the narrow band of stars around the sky through which the sun, moon, and the planets Mercury, Venus, Mars, Jupiter, and Saturn move. These seven objects, whose motions were an enigma to the ancients, came to be regarded with special reverence. The belt of the sky they frequented was divided into 12 regions, each 30 degrees in length. As the earth circles the sun in its annual journey, the sun appears to have a corresponding motion that takes it, in turn, through each of the zodiacal constellations. The name zodiac comes from the fact that most of the constellations along this belt are named after animals. One of the most interesting and complete extant archaeological artifacts is the Zodiac of Dendera (see DENDERA). It is a huge Egyptian stone carving that represents the zodiac and all the hemispheres of the sky to the north as it was known prior to 1000 B.C. At least one other carved representation of the zodiacal figure of Leo has been preserved, which dates from earlier than 2000 B.C.

Seasonal Changes. As the sun changes its apparent position among the stars during the year, the stars in the direction of the sun cannot be seen, but a constantly changing panorama of stars becomes visible in the night sky. Since this panorama repeats its cycle from year to year, certain of the constellations have come to be identified with certain seasons. Thus Orion is a well known constellation in the winter evening sky, Leo in the spring, Scorpius in the summer, and Pegasus in the autumn. But these star groups now appear at a given hour in the evening, say at 9 P.M., more than a month earlier than was the case during early Greek times, because of the precession of the equinoxes (see PRECESSION). This phenomenon makes it possible to date certain historical events from rather limited records of astronomical observations; ancient sky maps also can be quite accurately dated by their placement of the constellations in a given season.

Star Catalogues. The first attempts at systematic compilation of information about the sky were made by the early Greeks. In the fourth century B.C., Eudoxus of Cnidus, who had traveled and studied astronomy in Egypt, wrote an accurate description of the sphere of the sky. He listed 45 constellations: 20 in the northern hemisphere (outside the zodiac), 13 in the zodiac (the Pleiades being considered as separate from the rest of the constellation Taurus), and 12 in the southern hemisphere. The original work of Eudoxus is no longer extant, but the classical poet

CONSTELLATION

Ancient observers with vivid imaginations named groups of stars for gods, heroes, and animals associated with their myths and legends. The outlines of some of the brighter constellations bear a close resemblance to their namesakes; for example, the winter constellation Orion can easily be imagined as a hunter, and the summer constellation Scorpius, as a scorpion stretching across the sky. In learning the constellations today, however, it is easier to look for the simple geometrical figures than to trace the outlines of ancient figures. Locating the large and small dippers and the W in the constellation Cassiopeia offers a good starting point for the beginner. Each of the following maps should be considered as only a segment of the whole celestial sphere, roughly corresponding to that portion of the sky which you can see, depending on your observation point and times of viewing.

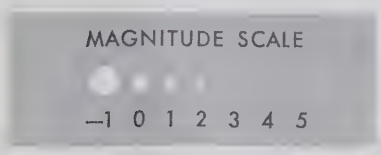


MAP 1

Stars in the region of the north pole. A straight line through α and β Ursae Majoris of Ursa Major passes through Polaris. When Ursa Major is high in heavens, Cassiopeia is low in the north.

MAP 2

Stars in the region of the south pole. These stars are always below the horizon for observers north of latitude 40°N. About 30° from the south pole shines the bright constellation Crux.

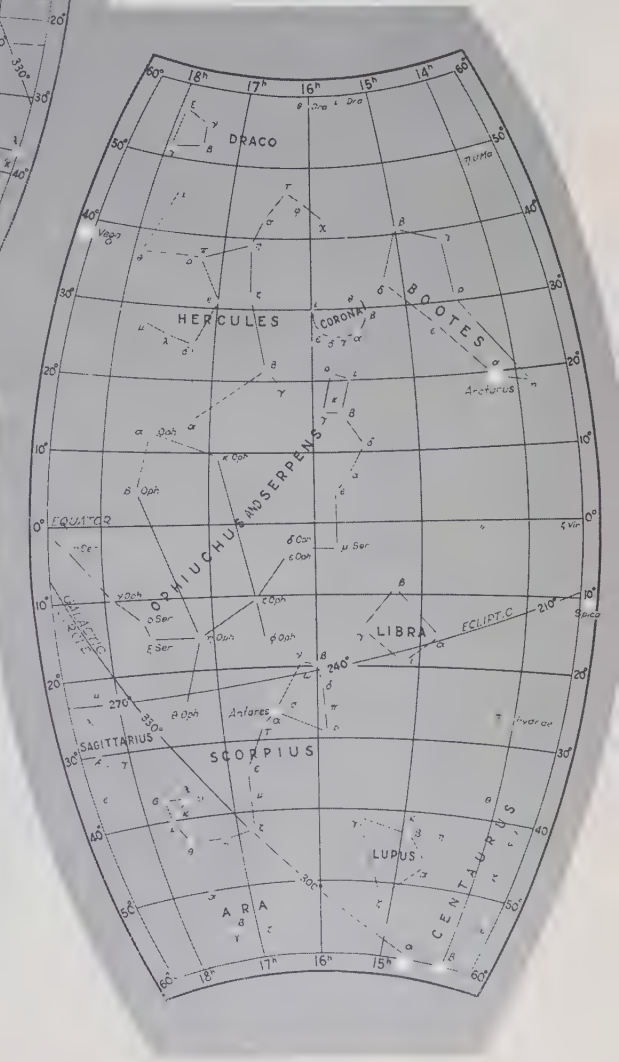


Maps from *Astronomy*, by John Charles Duncan (Harper & Brothers).

Observers in the northern United States can see all the stars in the region of the north pole, Map 1, but cannot see stars in the region of the south pole, Map 2. The remaining stars, represented on Maps 3 through 8, show only the portion of the sky near the celestial meridian, a line extending overhead from pole to pole. As the evening progresses the stars appear to move from east to west. The stars charted by some of the maps cannot be seen in the sky during the night at certain times of the year, because these maps represent the sky during the daylight hours. In general, an observer in the mid-northern latitudes will see the stars within the central region of Maps 3 through 8 halfway up from the southern horizon at the dates and standard times given in the various map descriptions.

MAP 3

The central hour line passes through the meridian at 8 P.M. on Sept. 22; 10 P.M. on Aug. 22; midnight on July 22. The great cross of Cygnus is almost directly overhead; Aquila is southward.



MAP 4

The central hour line passes through the meridian at 8 P.M. on July 22; 10 P.M. on June 22; midnight on May 22. Boötes, Hercules, and Scorpius dominate the early evening sky of summer.

MAP 5

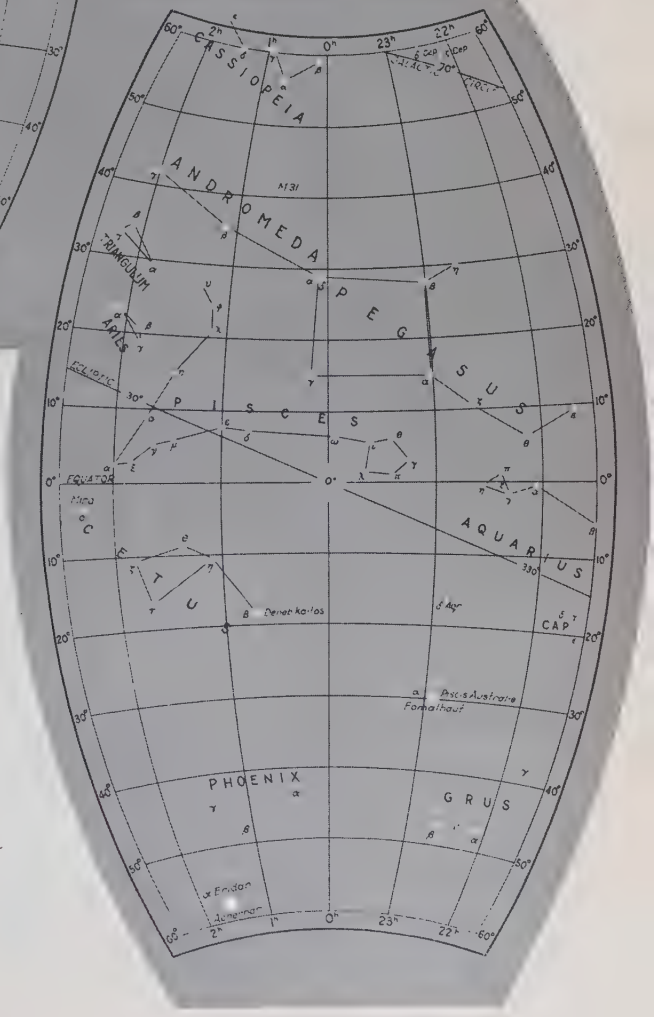
The central hour line passes through the meridian at 8 P.M. on May 22; 10 P.M. on April 22; midnight on Mar. 22. The dipper is high in the northern sky. A line drawn from its bowl enters Leo.

MAP 6

The central hour line passes through the meridian at 8 P.M. on Mar. 22; 10 P.M. on Feb. 22; midnight on Jan. 22. One of the nearest stars to the earth, Sirius, brightly shines in Canis Major.

MAP 7

The central hour line passes through the meridian at 8 P.M. on Jan. 22; 10 P.M. on Dec. 22; midnight on Nov. 22. Auriga, with its bright star Capella, is nearly overhead. Orion is southward.



MAP 8

The central hour line passes through the meridian at 8 P.M. on Nov. 22; 10 P.M. on Oct. 22; midnight on Sept. 22. Cassiopeia is nearly overhead, Pegasus, high in south. Fomalhaut is south.

comprise the physical composition of the state such as land, people, institutions, governmental machinery, and ideals of high principles of public morality and justice. In the legal sense it refers to the "instrument of evidence" or the fundamental statutes, charters, or documents which embody the essential parts of the organic law of the state. J. A. Jameson described the constitution as an expression in technical language of certain formulas addressed by the state to its citizens. Georg Jellinek held that a constitution is a body of juridical rules which determines the supreme organs of the state and prescribes their mode of creation, their mutual relation, their sphere of action, and finally the fundamental place of each of them in their relation to the state. Judge Cooley defined a constitution as the fundamental law of the state, containing the principles upon which government is founded, regulating the division of the sovereign powers, and directing to which persons each of these powers is to be confided and the manner in which each is to be exercised.

Constitution comes from the Latin word *constitutis*, meaning that which is established, although even in the time of Cicero it had no precise legal connotation and referred to any body of regulations, decrees, or ordinances. One of the four books of the famous Justinian Code (533) was the *Codex constitutionum*, which was the compilation of all laws in force. The *novellae constitutiones*, issued later, were collections of all new decrees and ordinances. One of the first examples of the term in English legal history was in the Constitution of Clarendon (1164) in which King Henry II attempted to define the boundaries of canon and civil law in England.

History of Constitutional Development. Although modern constitutionalism was unknown to the ancient world, the Greeks were familiar with collections of laws such as codes. Athens lived under 11 so-called constitutions from 624 to 404 B.C. Aristotle described 158 "constitutions" which were in fact merely collections of laws and customs.

In Rome, the *constitutiones* were a collection of laws or ordinances made by the emperor or the praetor, and even included precedents, statements of opinion by lawyers or statesmen, customs, usages, and beliefs as well as statutes. Despite the defects and informal character of the Roman constitution its influence extended into the Middle Ages: Roman law was a legacy which formed the basis for the revival of the study of law in continental Europe in the late fourteenth century; the conception that the ultimate power of the emperor, although in theory only, was lodged in the estates gave encouragement in the fourteenth century to the establishment in France of the Estates General; and the Roman love of unity and order formed a pattern of political unity in the upsurge of nationalism in the eighteenth century.

Feudalism was a kind of medieval constitutionalism since it was to some extent systematized into a generally accepted form of social and political organization. The system predicated large land holdings presided over by overlords under the general principle that every man must have a lord. Although the power of the barons had brought some political stability, it delayed the coming of the unified nation-state. The great struggle of the Middle Ages was between the strong kings and the strong nobles, one working for centralization and the other for the diffusion of power. The rise of cities and towns militated against the barons as it automatically helped to break their hold over the land. Furthermore, cities and towns, and in some instances even the church, received written charters from the king defining their rights. The charters had the characteristics of contracts. These precedents promoted the idea that concessions from the king to his subjects should be written instruments, even as was the Magna Charta.

With the decline of feudalism the crown emerged as the great unifying force of the state. On the Continent "enlighted despotism" meant complete absolutism in France, Russia, Prussia, and Austria. This period began in the fifteenth century; it came to a sudden end in 1789. It was marked by professional bureaucracies. Constitutionalism made slow progress under King Louis XIV and his successors. When it finally came it was by revolution.

In England the monarchy had seldom reached despotism. There were the feuds of King James I and his parliaments and the Civil War under King Charles I (1642–49), which resulted in parliament's sending a king to the execution block. The uneasy restoration under Charles II and James II resulted in the Glorious Revolution of 1688, a bloodless revolution that established the supremacy of parliament. This new development was solidified by such statutes as the Bill of Rights, the Mutiny Act, and the Toleration Act. Thus ended absolute monarchy in England. Parliament was sovereign, the Protestant character of the state was assured, and the aristocracy firmly established. A new class had come to power and its freshly acquired position was guaranteed by written conventions. Meanwhile the "rule of law" which protected the legal equality of citizens had become firmly established.

The Glorious Revolution was the turning point in British constitutional development. In the following century England was admired by such French philosophers as Montesquieu, Voltaire, and Rousseau as the land where despotism had disappeared and man was free. The early impetus for constitutional government which came from England gave rise to the ageless comment, "England, the mother of Parliaments."

The same constitutionalism which appeared in England was carried to the British colonial empire, especially in America. The king granted charters to these colonies providing for the kind of government to be established, the limited form of representation, and the court system. In the 13 colonies there were eight royal charters, three proprietary charters, and two self-governing charters. All of these charters provided for some measure of representation. With this background of experience it is not surprising that the American colonies when they separated from the mother country turned to written documents as fundamental law. Such documents included the state constitutions (1776–80), the Articles of Confederation and Perpetual Union (1782), and finally the Constitution of the United States (1789). The period from 1776 to 1789 has been called the era of constitutions. Lord Bryce declared that these constitutions were among the greatest contributions ever made to politics as a political art. Prime Minister Gladstone of Great Britain declared that the Constitution of the United States was "the most wonderful work ever struck off at a given time by the brain and purpose of man." The American constitutions were the practical application of the written fundamental law. The American example was soon followed by France.

Jean Jacques Rousseau published in France the *Social Contract* in 1762. This spectacular book had a profound influence upon both the theory of revolutions and constitutionalism. Rousseau was a powerful inspiration behind the French Revolution. He reasserted the theory of natural rights and the corollary thesis of revolt. Liberty, according to Rousseau, was an inherent right and when denied by autocratic rulers must be resisted by the people. The delicate relationship of liberty and authority Rousseau left to what he termed the General Will. Under the spell of the *Social Contract* the National Assembly in 1789 adopted "A Declaration of the Rights of Man and Citizen," which became the model for a bill of rights in all European constitutions. The Declaration was little else than an elaboration of Rousseau's thesis that "Men are born free and equal in rights; law is the expression of the General Will. Sovereignty resides exclusively in the nation (the

people); and the nation has the imprescriptible right to change its constitution." A constitution for France was adopted in 1791.

The American idea of a written constitution was soon followed by a number of European states as regards form, but the content followed the French pattern. Spain secured a constitution in 1812, Norway in 1814, the Netherlands in 1815, Belgium in 1831, the German states in 1814–1928, Italy in 1848, Austria in 1861, and Sweden in 1866. By the end of the century every European state except Great Britain, Hungary, and Russia had a written constitution. However, these constitutions were not necessarily the fundamental law of the land protected by the law courts. That was to come later.

Political Theory of Constitutions. Much impetus was given the development of constitutionalism by the philosophy of natural law. Protestantism in the sixteenth century, based upon justification by faith, gave emphasis to the individual as well as rise to the concept of the national church. Hence, political philosophy in this period was concerned largely with the contest between the divine right of the king as opposed to the divine right of the papacy. Could a king resist the power of the pope, and if so should his Catholic subjects refuse to obey him? The Huguenot writer Francis Hotman declared that the king was in fact elective and his power limited by the Estates General, which represented the entire kingdom (*Franco-Gallia*, 1573). The crown, therefore, according to Hotman, derives its authority from the fact that it is the agent of the community. This was the influence of Roman philosophy of government. The Huguenot writers, of which there were many, crystallized their thinking generally into the theory that there was originally a contract by which a people became a state: the king was bound by this mythical, prehistoric agreement to rule well and justly, and the people were bound to obey him so long as he did. The main purpose of this thesis was to prove the right of the people to oppose a heretical king.

With the opening of the seventeenth century political philosophy became dissociated from theology, although certain overtones remained in the proposition that a person understood natural law by right reason imparted by God. Religious controversy, however, had ended for the most part, and the revival of the reading of Plato and Aristotle together with the growing emphasis upon mathematics and physical sciences gave a decidedly secular character to the age. The contract theory persisted as interpreted variously by Bodin, Althusius, Grotius, Hobbes, and Locke. If the king became arbitrary, if he violated his trust, subjects might revolt as did the English under James II in 1688. The contract theory now provided the excuse for resistance against the ruler (apart from his religion) as sovereign power was supposed to rest in the people (the nation). The American Declaration of Independence, following Locke, gave this statement of natural law:

"We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed. That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness."

This statement of natural law presents four basic principles: the universe, including man, is subject to the law of nature, which is the revelation of the will of God; all men have certain natural or God-given rights; government exists to secure these rights; and all just governments derive their authority from the consent of the governed. Thus was formulated the philosophy to oppose King George III, to justify revolution, and to establish government by the people. The influence of natural law in the eighteenth century, especially in the United States and France, was supreme.

Modern constitutionalism grew in the eighteenth and nineteenth centuries mainly from two sources—*nationalism* and *representation*. The emergence of these two institutions marked the distinction between constitutions in the modern age and the so-called constitutions of antiquity. Dr. C. F. Strong states that constitutions could not have grown in the soil of the ancient world. In the modern age nationalism evolved after the French Revolution, 1789–95, and was part of the concept of the nation-state. Athens was a city-state with the accent on the small compact community, and Rome was a far-flung, disjointed empire. The nation-state was the unified people of a given area possessing a government and sovereignty.

Nationalism postulates that a people may be bound together by common interests, culture, language, tradition, and ethnic origin. Nationalism gives vitality to a people to preserve their entity and special characteristics, all of which bind them fervently to the nation-state. This strong sense of belonging creates the determination for participation in government.

Representation is the outgrowth of the need of the people of the nation-state to express their demands in legislative action. Like the nation-state, representation is of comparatively recent origin. In antiquity, the legislative power was exercised by kings or by people themselves in primary assemblies. The historian E. A. Freeman held that "the ancient world trampled on the very verge of representation without actually crossing the boundary." Not only was the system of representation never used, but the word itself was unknown. Dr. Henry J. Ford assumed that representative government dates back little before the middle of the nineteenth century although it originated in England in the seventeenth century. Representation means that a legislature is chosen by the free election of the people and that the elected deputies are responsive to the wishes and instructions of their constituents, although not bound by them; yet if their actions displease their constituents they can be dropped or defeated at the next election. Representatives are thus responsible to their electorate.

With the establishment of representation, the standard of the *higher law* became a logical necessity. Kings emerged from the age of feudalism claiming omnipotence from the theory of divine right. The new representative bodies required an even more forceful theory in order to curtail and to circumscribe the royal prerogative. Hence, the demand for a fundamental law which would be greater than, or above that of, the king, a fundamental law that would protect, yet give power and emphasis to, the representative assemblies. This higher law was a constitution (written).

The first written constitution was that of the United States unless Cromwell's Instrument of Government in 1653 can be called a constitution. The Constitution of 1787 set the mold of government under the higher law. The American doctrine when fully formed included: the written constitution as the expression of the supreme will of the people, the establishment of courts of law to interpret the written constitution, and the organization of political parties as the channel to maintain free elections and the choice by ballot of representative assemblies.

Constitutional and Statutory Law. The classification of law into ordinary law and a superior or higher law, or organic law, was discussed in seventeenth century England. In the reign of James I (1603–25), Chief Justice Sir Edward Coke took issue with the king over the source and scope of his prerogative. Coke asserted that the king was under the

law and that judges were not mere delegates to execute his wishes. "The King cannot create any offense by his prohibition or proclamation, which was not an offense before." Not only did Coke attempt to restrain the unlimited power of the king but he also tried to establish the superiority of the courts over parliament by declaring that a statute would be invalid if contrary to law. "The surest construction of a statute is by rule of reason of the common law, and acts against this law are void," Coke declared. Thus he held that the power of the king and the parliament were limited by the common law and the law of nature. Although Coke was removed from office, his "rule of law" soon found its way into British jurisprudence.

The idea of the "rule of law" was inherent in the charters extended to British colonies and became the basis of government in the dominions of the British crown and later in the United States. In the years preceding the American Revolution, colonial leaders spoke of an English constitution and its supremacy over parliament. "An Act against the Constitution is void," James Otis said in 1761. The colonial courts in America asserted the right to hold void any act of the assembly which was found to violate the terms of the charter or the laws of England. In 1768 a resolution of the Massachusetts legislature declared that the "Supreme Legislature in every free state, derived its power from the Constitution, by the fundamental rules of which it is bounded and circumstanced."

A few years later this "rule of law" thesis was firmly established in American political thought by the famous decision of the U.S. Supreme Court in *Marbury* v. *Madison* in 1803. In this case the court voided a portion of an Act of Congress, the Judiciary Act of 1798. The opinion of Chief Justice John Marshall recognized the two categories of law—*constitutional law* and *statutory law*. The case firmly established the doctrine of judicial review: all acts of Congress (statutory) must be in conformity with the law of the Constitution and all acts are subject to review by the Supreme Court.

In France Jean Bodin related in 1576 that jurists, particularly those of the natural law school, had shown a distinction as early as the fourteenth century between the fundamental laws of the kingdom (*les lois fondamentals du royaume*) and the laws of the king (*les lois du roi*). The first included certain established traditions and principles which had grown up over the centuries and which the king accepted as not being within his power to abrogate or alter without the consent of the Estates General. Such fundamental principles, for example, concerned the new levy of taxes, modification of the Salic law of succession to the throne, and alienation of any of the territorial domains of the state. If he violated these laws his subjects were no longer bound to obey him. Although jurists and historians continued to emphasize this distinction in the laws, it was not always observed by the kings. In the seventeenth century the distinction disappeared in the presence of absolute monarchy. "The state, it is I," proclaimed Louis XIV. With the French Revolution in 1789 the spirit of the old tradition expressed itself as the primary grievance because of the lack of a constitution. Sieyès, who led the fight for a written constitution in the Estates General, summed up the sentiment of the body when he declared that the legislative power must be limited by the constituent power.

Despite the long groping toward the higher law as a protection against autocratic government, it found expression in its fullest meaning only in the United States. The most basic classification of constitutions, therefore, rests upon this thesis of the higher law. There are other and somewhat more traditional classifications of constitutions.

Classification of Constitutions. It was once customary to begin the classification of constitutions with the category of *written* and *unwritten* documents in accordance with the brilliant discussion on the subject by James Bryce. This classification has become almost obsolete, as the terms are not exclusive of one another. A written constitution is often a single document yet does not function in this form alone. There are customs and judicial interpretations which expand the meaning beyond the written word. On the other hand, unwritten constitutions are defined as being a mass of customs, usages, judicial decisions, and statutory amendments of a fundamental character. Thus the unwritten constitution includes much that is written. Nevertheless, there is a valid distinction between written and unwritten constitutions in that a written constitution often is an instrument of special sanctity, the higher law, different from and superior to statutory enactment. Exceptions to this are the written instruments made by a ruler, such as the Statute granted to Piedmont by King Carlo Alberto in 1848 and the Prussian Constitution of 1850 decreed by Frederick William IV. Another exception was the constitution of the Third Republic of France which consisted of three short acts and provided only for the bare structure of government.

The written constitution as the fundamental law automatically establishes two bodies of law: one constitutional and paramount, the other statutory and subordinate. The written constitution is distinct in form and altered by a different procedure from that of statutory law. Furthermore, it is customary for the written constitution to be enacted by a convention of the people chosen for that purpose. This fact gives weight and power to such instruments. The clearest act of popular sovereignty is the writing of a constitution, and when this is accomplished by a popular convention the greatest force within the nation-state has been solidified. The unwritten constitution, on the other hand, is cumulative and evolves slowly from custom, convention, statutes, and decisions.

Flexible and *rigid* are other classifications used by Bryce and considered a more useful test of difference. Yet again there are conflicts of views. Some writers hold that if the constitution can be changed by the same procedure as the passage of a statutory law it is a flexible constitution. This places constitutional law and ordinary law on the same level, as both are enacted in the same way and by the same source. By this definition the constitution of Great Britain (unwritten) is a flexible constitution. Other writers, however, believe that flexibility consists in the ease and frequency of making constitutional changes. Such theorists hold that the written constitution in practice may be easier to amend than the unwritten constitution, which is based on slowly changing custom. The British constitution, for example, changed little in the nineteenth century, being limited chiefly to the extension of the suffrage, limitation of the House of Lords, and the change in status of the self-governing dominions. Contrarily, the written constitution of the United States changed frequently but more often by judicial interpretation than by formal amendment. A more logical test as to whether or not a constitution is flexible, therefore, is the number of its alterations. If it is rarely changed, it may be classed as rigid. Thus, some written constitutions may be flexible and some unwritten constitutions may be rigid.

A few authorities also classify constitutions as to the type of government which they establish as unitary or federal, unicameral or bicameral, presidential or parliamentary, single member or multimember election districts, and so on through every facet of governmental divisions.

Trends in Constitutions. Traditionally, prior to World War I, the essentials of a written constitution were: provisions for the organization of the government, the distribution of its powers among the several departments, the organization of the particular agencies through which the state functions, elections

of public officials, and the composition of the electorate; the procedure by which formal amendments of the constitution may be made; and a section on the civil rights of individuals, commonly called a bill of rights.

Since World War I new constitutions contained additional characteristics which reflected the fears and instability of the age of wars and of police states. These characteristics began to appear with the Weimar Constitution of 1919 and culminated in the French Constitution of 1946, the Italian Constitution of 1947, and the West German Republic Constitution of 1949. There are four notable changes in these documents: judicial review, individual rights, nationalization of public service industries, and "social justice."

Judicial review is one of the most significant additions to constitutionalism. This is an American feature which for more than 150 years was largely ignored by constitution-makers in other countries but which in the twentieth century had a firm influence on continental European thinking. The reason for this sharp change is twofold: to make the law courts the guardian of human rights; and to establish more clearly the constitution as the fundamental law. Recognition for the need of judicial protection of individual rights has developed from the ease and swiftness by which they were destroyed by parliamentary majorities in totalitarian countries. The "constitutions" of the Lander in the Soviet zone of Germany contained impressive lists of rights but their interpretation was left to a committee of the Communist-dominated parliament. Of course, the courts can only make it more difficult for constitutional rights to be swept away, they cannot ultimately prevent it. The use of judicial review to establish the high law again reflects the American influence. In order for a written constitution to be regarded as the superior law of the land there must be a judicial system whereby the courts may refuse to recognize the validity of laws which they hold in violation of it.

Individual rights (civil rights) are reaffirmed in language more definite and sweeping than in earlier constitutions. Furthermore, these rights were made an integral part of the constitution and given special importance by being placed at the beginning of the document (the Bill of Rights was added to the U.S. Constitution as its first 10 amendments). Economic and social rights comprise a vast extension of human rights guaranteed by the state, and include protection of health and maternity, old age pensions, education, rest and leisure, and care of the indigent and underprivileged, as well as such rights as employment, organization of trade unions, the right to strike and bargain collectively, and vocational training. The length and detail of the new constitution has become also a conspicuous deviation.

Clearly apparent in all these new constitutions is the effort to anchor the human rights of the welfare state to the constitution and to protect them by courts of law as a most sacred pledge to the people. This trend has been influenced by an effort to transcend the false appeal of the totalitarian constitutions with their hypocritical promises; yet there is also a brave desire to hold tightly the essentials of human freedoms and dignity. While socialization and economic planning are inherent parts of these constitutions, the constitutions themselves are within the general framework of private enterprise. They all provide that when industry has acquired the characteristics of a national public service it should become the property of the state. An effort for moderation is apparent although the clear trend is toward "social justice" with property rights becoming less exalted than human rights. Dr. C. F. Strong summarizes the basic purpose of constitutions today as the securing of social peace and progress, the safeguarding of individual rights, and the achievement of national commonweal.

False Constitutions. The dictatorship of the proletariat under Lenin and, later, Stalin found it convenient for propaganda purposes to use the constitutional device of European and American states in order to deceive the Russian people as well as foreign peoples by creating a false façade of democracy. Lenin's Constitution of 1918 for the Russian Socialist Federation of Soviet Republics, as well as the constitutions of 1924 and 1936 of the Union of Soviet Socialist Republics, did not create a republic in the European sense of the word or a government in which the people actually participated. Furthermore, they did not create a federation, or a state composed of autonomous units. On the contrary, the U.S.S.R. is one of the most centralized of governments. Likewise, the freedom of speech, press, assembly, and religion seemingly guaranteed by the U.S. Constitution has been denied to the citizens of the Soviet Union because of the deceitful limitation stated in the article which says, "conformity with the interests of the working people." Under the one-party control of the Communist party, elections are supposed to be free but all candidates must be approved by the party chiefs. The legislature, the Supreme Soviet, does not even function as a legislature. It meets only long enough each year to turn affairs over to the Presidium, which is under the iron discipline of the party leaders.

The same deception was practiced when the constitutions were adopted by the Communist parties in the East European satellites, such as the so-called People's Republic of Hungary. The same deception was used by Mao Tse-tung in creating the so-called People's Republic of China. A realistic study of constitutional law in all Communist regimes requires greater attention to the doctrine and rules of the Communist party than to the alleged constitutions.

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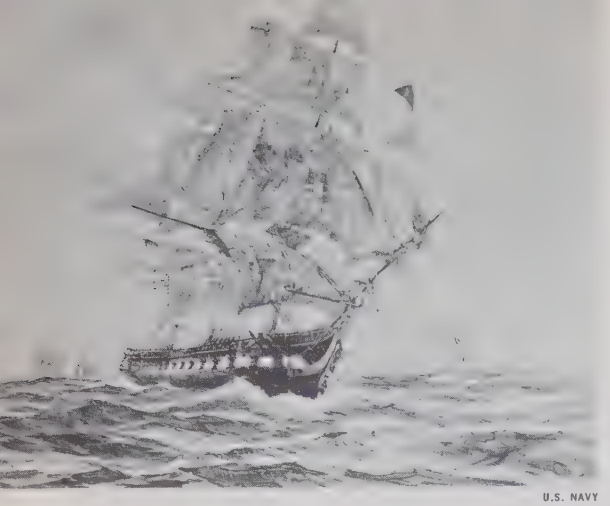
CONSTITUTION, or "Old Ironsides," U.S. ship, constructed by the government in Boston and launched there in 1797. Considered to be an unsurpassed product of the shipbuilding art, the *Constitution* was a frigate of 1576 tons, and was rated a 44-gun vessel, although it actually carried up to 55 guns in combat. The vessel served in the quasi-war with France. During the war with Tripoli it was in turn flagship of Comm. Edward Preble, 1803–04, and Comm. John Rodgers, 1805–06, and was part of Comm. James Barron's squadron, 1804–05. On board the *Constitution* the treaty of peace was negotiated and signed, June 4, 1805.

In July 1812, three weeks after the outbreak of the War of 1812, the *Constitution* put to sea from Annapolis, under command of Capt. Isaac Hull, and soon fell in with a British squadron of one 64-gun ship and four frigates. For three days these ships chased the *Constitution*, which outdistanced them to Boston. On August 19, off Cape Race, the ship defeated and left a total wreck the smaller British frigate *Guerrière* after a severe fight lasting only 30 minutes. On December 29, while under the command of Capt. William Bainbridge, the U.S.S. *Constitution* met the frigate *Java* (38 guns) off Bahia, Brazil, and defeated it after a two-hour engagement. During



U.S. NAVY

The 55-gun *Constitution* won the first important U.S. naval victory of the War of 1812 in a stirring battle with the British man-o'-war *Guerrière*, off Newfoundland.

1813 the *Constitution* lay in Boston Harbor, which was blockaded by the British fleet. On Feb. 14, 1814, commanded by Capt. Charles Stewart, it captured the *Pictou* (16 guns) and her convoy. During the rest of the year the *Constitution* was again inactive because of the British blockade. On Feb. 20, 1815, after a memorable engagement, it captured the *Cyane* (34 guns) and the *Levant* (18 guns), but was in turn pursued by three British frigates and forced to relinquish the *Levant*.

In 1830 a proposal to dismantle the *Constitution* was abandoned because of popular opposition, mainly aroused by the publication of Oliver Wendell Holmes' poem "Old Ironsides." Subsequently the famous old ship served as a training vessel and underwent several reconstructions. The *Constitution* is maintained as a historical relic at the Boston Navy Yard.

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CONSTITUTIONAL CONVENTION is a group of persons deliberately called together and entrusted with the establishment of a new constitution of a state, or the revision or amendment of an existing constitution. In some countries proposals by a constitutional convention must be ratified by the legislature or a referendum.

Constitutional conventions originated in the American Revolution, when several states expressly authorized the existing legislatures to frame fundamental laws for the recently emancipated colonies or elected special bodies to do so. Underlying this new institution were the belief that only a written constitution can properly safeguard newly won liberties and the theory of the social contract as the basis of government by consent of the governed. The Continental Congress of 1777, which submitted the Articles of Confederation to the states for ratification, and the Federal Convention of 1787, which drafted the U.S. Constitution, are the best known constitutional conventions.

In their constitution-making capacity constitutional conventions are essentially revolutionary bodies, established after the overthrow of an old regime to secure a firm new basis for political life. Constitutional conventions followed the 1789 revolution in France, revolutions in Spanish-American colonies in the nineteenth century, revolutions in the Russian and Austro-Hungarian empires of 1917 and 1918, and in the colonial areas in Asia emancipated since 1945.

In their revising and amending capacity, constitutional conventions became integral parts of governmental structures in some countries, as a mechanism for adopting the existing constitution to the changing political, social, and economic conditions. Article V of the U.S. Constitution prescribes two possible ways of amending the Constitution, one of them providing for calling a federal constitutional convention to propose amendments and state conventions to ratify them. See Constitution of the United States.

CONSTITUTIONAL GOVERNMENT. See Government, *Classifications of Government*.

CONSTITUTIONAL LAW is that branch of law which deals with the theory and practice of the form of government established under a constitution.

There are three distinct types of constitutions: the so-called "unwritten constitution" characteristic of the United Kingdom and Canada which consists of important statutes, conventions, customs, and traditions; the type representative of continental European nations which is a formal written document without any provision for judicial enforcement; and the type symbolized-by the United States Constitution which is a formal written document construed or interpreted and enforced by the courts.

The United States has a federal, or dual system of government; that is, there are a national government and several state governments operating in theoretical concord within different carefully defined spheres of activity. The federal system is distinguished by the doctrine of limited and residual, or general, powers. The national government was delegated, or loaned, limited powers under the Constitution by the several states, or more specifically, by the people of the several states. The national government has the use of only those few powers expressly listed in the Constitution as appropriate for it to exercise. The several states have the use of all other powers, both that class of powers expressly listed in the Constitution as proper for the states to exercise and all of the infinite number of powers not mentioned in the Constitution at all, except those powers which would negate certain natural rights of man.

The national and state governments are characterized by republican, or representative, government. The word "democracy" is nowhere mentioned in the Constitution. But Article IV, section 4, of the Constitution declares that "The United States shall guarantee to every State in this Union a Republican Form of Government."

The national and state governments are also characterized by the tripartite division; that is, each has three departments, the executive, the legislative, and the judicial.

The national and state governments, with the exception of Nebraska, are further characterized by bicameralism; that is, each has a two-chambered, or two-housed, legislature.

Unlike the United Kingdom, where the parliament is the seat of sovereignty, in the United States sovereignty resides in the people of the several states.

Since sovereignty resides with the people of each state, each state (that is, the state government, particularly the state legislature) is the primary agent of the people of each state, who constitute the principal. When the people of each of the original 13 states, as represented in state constitutional conventions, ratified the Articles of Confederation and Perpetual Union, this act was analogous to the entering into of articles of general copartnership. Each state government was retained by the people as their primary agent, but was to abstain from the exercise of certain powers it formerly held in trust for them because the exercise of such powers was reassumed by the people and thereupon delegated to a joint subagent—the national government.

When the Articles of Confederation and Perpetual Union were amended and styled the Constitution for the United States, the national government was dele-

gated a greater exercise of power by the people of the ratifying states than had been delegated to it under the Articles of Confederation and Perpetual Union by the people of the ratifying states. But this increase in the exercise of power delegated to the joint subagent—the national government—was a subtraction of the exercise of power not from the people of the states but from the state governments. The people of the states delegated no new exercise of power to the national government when through their representatives in state constitutional conventions they ratified the Constitution for the United States, but simply reassumed the exercise of additional powers previously delegated to their state governments and then delegated the exercise of these same additional powers to the joint subagent. See CONSTITUTION OF THE UNITED STATES.

The Constitution of the United States is construed by the national and state courts, most importantly by the Supreme Court of the United States, which is the only court mentioned in the Constitution by name and for that reason known as a constitutional court, the other general classes of national courts being the district courts and the courts of appeals. In construing the Constitution the courts exercise the doctrine of judicial review, which is the power of a court to decide that a national or state law is in conflict with the Constitution and as a result void. There is no authority in the Constitution for the exercise of this power by the national courts. The types of cases which come within the jurisdiction of national courts as matters of constitutional law are those involving so-called federal questions—most of which relate to interstate commerce—or to admiralty, ambassadors, those that have the United States as one party, and those cases which have as opposing litigants states, a state and a citizen of another state, citizens of different states, citizens of the same state claiming lands under grants of different states, or a state and a foreign nation. H. N. M.

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CONSTITUTIONAL UNION PARTY, a political party in the United States which took part in the presidential campaign of 1860. Largely a temporary union of Whigs and southern "Know Nothings," who wished to avert the threatened conflict between the North and the South, it was strongly opposed alike to disunion and abolitionism. At a national convention held at Baltimore on May 9, 1860, John Bell of Tennessee was nominated for the presidency and Edward Everett of Massachusetts for the vice-presidency—hence the name "Bell and Everett Party" by which the party is often known. In lieu of a platform the convention adopted a resolution the essence of which was that since partisan platforms "had the effect to mislead and deceive the people, and at the same time to widen the political divisions of the country by the creation and encouragement of geographical and sectional parties, . . . it is both the part of patriotism and of duty to recognize no political principle other than the Constitution of the country, the union of the states, and the enforcement of the laws." In the ensuing election, in which Abraham Lincoln was elected president, Bell and Everett received 39 electoral votes—those of Virginia, Kentucky, and Tennessee—and about 590,000 popular votes, cast mostly in the South. See BELL, JOHN; EVERETT, EDWARD.

CONSTITUTIONAL VARIATION. See CRIMINOLOGY, Criminal Anthropology.

CONSTITUTION OF THE UNITED STATES

The oldest written constitution still in force satisfies the needs of Americans today.

CONSTITUTION OF THE UNITED STATES, the written document which by its own wording is the supreme law of the United States of America. The British statesman William E. Gladstone called the United States Constitution "the most wonderful work ever struck off at a given time by the brain and purpose of man." The Constitution was drafted in a convention of 55 delegates, meeting together for three hot summer months in the year 1787 in Independence Hall in Philadelphia. The delegates, many of them learned men, and nearly all of them men of political experience, gave due attention to the history of government from the Greek city-states to the empires of the eighteenth century. More than this, they drew upon the practical art of government practiced in the 180-year history of the American colonies, as well as the rich traditions of liberty that had developed in Great Britain for more than eight centuries. The records of the Philadelphia debates, however, show that in drafting the Constitution the delegates depended most heavily upon their own experience of actual government in the 13 colonies and newly formed states.

History's First Permanent Written Constitution. The Constitution, having been ratified by 11 of the 13 states in 1788, went into effect on September 13, 1788. Today, the Constitution is the oldest written constitution of a modern republic. It was, in fact, the first permanent written constitution of any independent nation. Previous to its adoption the American colonies were governed under royal charters granted by the British crown. These charters were written documents. During the American Revolution, 11 of the colonies adopted new constitutions that were, of course, written documents. The new states, however, were bound together by the Articles of Confederation and Perpetual Union into the Confederation of the United States of America. Thus, the Constitution of 1787 was the first permanent written constitution of a sovereign nation in modern history. In 1653, during the Puritan revolution in England, under Oliver Cromwell, parliament adopted a written constitution called the Instrument of Government. But this fundamental law was brushed aside by the Restoration of Charles II, and England returned to its tradition of an unwritten constitution based on custom and usage. The American example of written constitutions was soon imitated in Europe and Latin America and later in Asia and Africa.

The Constitution of the United States is the fundamental law of the land, establishing the general form of the national or central government, creating the organs of this government, distributing powers among these organs and limiting these powers. The Constitution also prohibits some powers to the state governments. It prescribes the relations between the national government and the state governments and among the several states. The body of the Constitution guarantees certain rights of persons against the national government. A more complete guarantee of civil rights is contained in the first ten amendments, adopted in 1791, and generally called the Bill of Rights. Other guarantees of individual liberty are found in later amendments, particularly the Thirteenth and Fifteenth amendments. Most of these guarantees run against the national government alone. The separate state constitutions contain similar bills of rights that guarantee civil rights as against the state governments.

Six Principles of Government. In drafting the Constitution, the founding fathers consciously accepted and followed six principles of government,

BETTMANN ARCHIVE

The Constitution, signed in 1787 and ratified in 1788, has no equal in duration and adaptability to changing times.

namely: (1) federalism; (2) republicanism, or representative government; (3) limitation of powers of government; (4) separation of powers; (5) the supremacy of the Constitution over ordinary laws; and (6) adaptability of fundamental law to changing conditions.

(1) The Constitution provides for a federal system of government. It creates the national or central government. The state governments of the 13 original states had already been created before 1787. Governments of the new states admitted to the Union have been created by constitutional conventions held by virtue of acts of Congress for this purpose.

(2) In drafting the Constitution, the fathers of the Constitution followed the republican principle of government. This principle holds that all government should be representative of the people.

(3) The Constitution is, as Chief Justice John Marshall said, both a grant of powers and a limitation on powers. These powers, he said, concern "those great powers on which the welfare of a nation essentially depends."

(4) The fathers also followed a principle popularized by the French political philosopher Montesquieu. This was the doctrine of separation of powers. Montesquieu held that liberty prevailed only under a separation of powers, namely a division of the legislative, executive, and judicial powers. The fathers modified this principle by the use also of checks and balances.

(5) The Constitution also rests on the assumption that there is a difference between fundamental law and ordinary acts of the legislature and orders of the executive. In other words, the written constitution is the supreme law, superior to statutory and administrative law which must conform to the fundamental law.

(6) The founding fathers did not view the Constitution as immutable fundamental law. The Constitution provided for an orderly procedure of amendment. George Washington, the President of the Constitutional Convention and the first President of the United States under the Constitution, in his Farewell Address in 1796, called the attention of the American people to this amending process. Chief Justice John Marshall, in the famous case of *McCulloch* v. *Maryland* in 1819, declared that the "Constitution [is] intended to endure for ages to come and, consequently, to be adapted to the various crises of human affairs."

Commentaries. Article VI, Section 2, of the Constitution states that laws passed by Congress are the supreme law of the land when made in pursuance of the Constitution and thereby implies the principle of judicial review to determine constitutionality—a doctrine formally announced by Chief Justice John Marshall in his decision on *Marbury* v. *Madison* (1803). Thus, every decision of the courts reviewing an act of Congress or of the state legislatures constitutes a commentary on some part or parts of the Constitution. During its approximately 170 years of existence a number of comprehensive commentaries upon the Constitution have appeared. Even before the ratification of the Constitution by the first 11 states in 1788, *The Federalist* was published. This was a collection of brilliant newspaper essays by Alexander Hamilton, James Madison, and John Jay recommending the various provisions of the Constitution to the voters and members of the ratifying convention in New York. Among the other outstanding commentaries is the *Commentaries on the Constitution of the United States*, 1833, by Justice Joseph Story, a member of the Supreme Court from 1811 to 1845. Another is *A Treatise on the Constitutional Limitations*, 1868, by Judge Thomas M. Cooley. The official annotation of the Constitution, showing the interpretation of the various clauses of the text by the Supreme Court, published by order of Congress, is *The Constitution of the United States of America: Analysis and Interpretation.*

Summary of Interpretation of the Constitution by American Courts

Preamble. The Supreme Court has consistently held that the Preamble is not a grant of power. It simply states the purpose of the fundamental law. In the case of *Scott* v. *Sandford* in 1857, Chief Justice Taney held that the term "We, the people" means the citizens of the several states, who, according to American republican institutions, form the sovereignty and hold the power to govern. They comprise what is familiarly called "the sovereign people."

Legislative Powers

Congress. Logically, the fathers of the Constitution devoted Article I to the lawmaking functions of the national government. It establishes Congress as the national legislature and defines its powers to the states. The language of Section 1 is very general. It provides: "All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives." The phrase "all legislative powers" includes the enumerated powers, chiefly found in Section 8.

Congress consists of two houses. According to Section 3, the Senate or upper chamber, composed of two senators from each state, was intended to be representative of the several states. Under Section 2, the lower house, composed of representatives from the several states, the number being in proportion to the population of each state, is representative of the people of each state. The Seventeenth Amendment, providing for the popular election of senators, ratified in 1913, removed all criticism that the Senate represents the legislatures rather than the people of the several states. The allotment of two senators to each state, leaving the number of representatives to be determined by the size of the population of each state, was a result of the famous "Connecticut compromise" in the Constitutional Convention. The compromise was a solemn agreement between the large and the small states, and it was designed to give all states equality in the Senate. This is the only part of the Constitution, as stipulated in Article V, which the founding fathers considered immutable and not subject to future amendment. It was a contract between the states, with the common understanding that good faith required its observance as long as the Union endured.

Representatives are elected by the voters in the several states for a two-year term, and senators for six-year terms. Under Section 4, the times, places, and manner of holding elections shall be prescribed in each state by the legislature thereof, but Congress may by law fix uniformity. In virtually all states, representatives are now elected from single-member constituencies similar to the election districts of members of the British House of Commons. Each house of Congress is sole judge of the elections, returns, and qualifications of its own members. A majority of each house is a quorum, but a smaller number may adjourn from day to day and compel under penalties the attendance of absent members. Each house may make its own rules and has the right to expel any of its members by a two-thirds vote.

Congress must assemble at least once each year. The presiding officer of the House of Representatives is the Speaker, who is elected by the members. The Vice-President of the United States presides over the Senate. The House of Representatives has the sole right of impeaching civil officers. The Senate then sits as the court of impeachment, while duly appointed members of the House of Representatives prosecute the case. When the President of the United States is tried, the Chief Justice of the Supreme Court presides over the Senate. Conviction requires a two-thirds vote of the senators present. Only one President has been impeached, and then conviction failed by one vote for lack of the requisite two thirds.

Under Section 6, senators and representatives enjoy the usual immunities accorded to legislators in all democratic countries. The privileged character of legislative debates is a tradition of Anglo-Saxon liberty. The immunity is also found in the constitution of every modern democracy as an absolute necessity for a free legislature.

Presidential and Parliamentary Systems Compared. A second clause in Section 6 stipulates that "no person holding any office under the United States shall be a member of either house during his continuance in office." This restriction requires the presidential form of government in opposition to the parliamentary form. In Great Britain, for instance, the ministers in the cabinet are usually members of parliament. Each system has its advantages and disadvantages. In Britain, parliament is supreme over the ministers of the crown. Under the American presidential system, wherein both the legislative and the executive branches of government are co-ordinate, the restriction prohibiting members of Congress from serving as heads of executive departments or from sitting in the President's cabinet is a logical consequence of the principle of separation of powers.

Section 8 provides that "all bills for raising revenue shall originate in the House of Representatives; but the Senate may propose or concur with amendments as on other bills." This provision follows the old British tradition of "no taxation without representation." Ever since the ratification of the Seventeenth amendment, however, senators represent the people of the several states, while the representatives represent the people in each congressional district. Thus, the restriction is no longer necessary. In practice, inasmuch as the Senate can amend revenue or tax bills by an amendment substituting its own bill, the constitutional prohibition is now inoperative.

Presidential Veto Power. The second clause of Section 7 provides that every bill that passes both the House of Representatives and the Senate requires the signature of the President before becoming law. The President, however, may not approve the bill. In this case, he exercises the *veto* (from the Latin word meaning *I forbid*). He may return the bill to the house in which it originated, with his objections in writing. If, after reconsidering the bill, both houses pass it by a two-thirds majority in each house, it shall become law regardless of the lack of the presidential signature. Section 7 also provides that "if any bill shall not be returned by the President within ten days (Sunday excepted) after it shall have been presented to him, the same shall be law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law."

The inclusion of the presidential veto in the Constitution, even at a time when the veto had already become obsolete in British parliamentary government, was consistent with the theory of separation of powers held by the founding fathers. The framers of the Constitution modified Montesquieu's doctrine of the separation of powers by a provision for checks and balances between the branches of government. As Madison explained in Essay 47 of *The Federalist*, the Constitutional Convention sought to preserve liberty by use of the separation of powers. The additional provisions for checks and balances allowed the President to check any excesses of Congress. On the other hand, the President was required to share the appointive power and the treaty-making power with the Senate. Thus, the Senate could check excesses of power on the part of the executive in these fields.

Enumerated Powers of Congress. Section 8 of Article I is often called the most important section of the Constitution inasmuch as it grants the legislative powers authorizing Congress to enact the laws which it is the duty of the President to enforce and the duty of the courts to interpret and to test the constitutionality thereof.

The power to tax is generally considered the most potent power of any legislature. Not only is taxation necessary for the support of any government, but also, as Chief Justice Marshall said in the case of *McCulloch* v. *Maryland* in 1819, "the power to tax is the power to destroy." Thus, the founding fathers again were logical in placing this power at the head of the list of enumerated powers.

Clause 1 of Section 8 delegates to Congress the power to levy certain types of taxes. Under the Constitution, all national taxes must be the same within every state of the Union. Also, all taxes must be for a public purpose. For a century the courts ruled that

the taxing power of Congress did not include authority to levy income taxes. This question was finally decided in 1913 by the ratification of the Sixteenth Amendment granting Congress such power. However, there is no ceiling in the Sixteenth Amendment on the income tax rates which Congress can levy. While the raising of revenue is the primary purpose of national taxation, the taxing power can be used to regulate business. There are strong objections to this use of the power to tax, and the Supreme Court has recognized some constitutional limits to its use, especially when it constitutes an invasion of the police powers of the states.

Clause 2 of Section 8 grants the power "to borrow money on the credit of the United States." Under the use of this power, the national debt reached $280 billion in 1956.

Commerce Clause. Clause 3 provides that Congress has power "to regulate commerce with the foreign nations, and among the several states, and with the Indian tribes." Ever since the ratification of the Constitution, by means of a "broad" rather than a "strict" interpretation of the fundamental law, the meaning of the commerce clause has been enormously extended. Chief Justice Marshall gave impetus to this expansion in the celebrated case of *Gibbons* v. *Ogden* in 1824 in which he held that "commerce" is not confined to traffic but includes buying and selling and even steamboat transportation. Such commerce is subject to Congressional regulation provided it is interstate commerce and not *intrastate* commerce (commerce wholly within one state). As inventions expanded the business activities of the American people, the railway, telegraph, telephone, airplane transportation, radio, and television have crossed state boundaries and have become interstate commerce. All of these activities have been deemed subject to the regulation of Congress under the commerce clause. The Supreme Court in a series of cases even held that "activity affecting interstate commerce" is subject to regulatory power of Congress.

The Sherman Anti-Trust Act of 1890, prohibiting monopolies or conspiracies in restraint of interstate and foreign commerce, was the first of the great regulatory acts under the commerce clause. It was followed, some years later, by the Pure Food and Drug Act, enacted by Congress in the interest of public health. Much of the legislation of the New Deal from 1933 to 1952 also fell in this category. Virtually all of this legislation constitutes a restraint upon the police powers of the states. Since 1936 the Supreme Court has inclined to give to the commerce clause the broadest possible interpretation short of specific prohibitions contained in other sections of the Constitution.

Immigration and Money. Clause 4 of Section 8 confers on Congress authority "to establish an uniform rule of naturalization and uniform laws on the subject of bankruptcies throughout the United States." None of the enumerated powers authorizes Congress to regulate immigration into the United States. In the Chinese Exclusion Case in 1889 the Supreme Court held that the right to exclude aliens was one of the inherent powers belonging to independent nations and thus a power which can be exercised legitimately by Congress. The Constitution, however, is specific regarding naturalization or the granting of citizenship to aliens. Under the Nationality Act of 1940, which is a codification of earlier statutes, Congress has provided a procedure that must be followed by aliens applying for citizenship. The Supreme Court has upheld as constitutional all congressional provisions that exclude from citizenship aliens who "believe in" or belong to groups that believe in the "overthrow by force or violence of the government of the United States or of all forms of law."

Clause 5, the money clause, grants Congress power to "coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures." The sixth clause gives Congress authority to punish counterfeiting. Clauses 7 to 10 confer on Congress power to establish post offices and post roads, to grant copyrights to authors and patents to inventors, to constitute tribunals inferior to the Supreme Court, and to define and punish piracy.

War Powers. The war powers of Congress are granted in clauses 11 to 16. Congress alone has authority to declare war (a provision that cannot be legally evaded by calling a war something else), to raise and support an army and to maintain a navy (but not an air force), to make rules for governing the armed forces, and to provide for the national use of the militia of the states. The war powers of Congress are closely related to and entwined with the war powers of the President. (See *Commander in Chief*, following.) The courts have construed the war powers of Congress and the President to be so extensive and vital to national existence that they may supersede many personal liberties guaranteed in the Bill of Rights. This was clearly the view of the court in the Japanese segregation cases during World War II.

Clause 17 confers authority upon Congress to exercise exclusive legislation over territories of the United States, including the District of Columbia.

Necessary and Proper Clause. The phraseology of Clause 18, sometimes called "the elastic clause," is significant. The clause gives Congress power "to make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the Government of the United States, or in any department or officer thereof." It was upon this clause that Alexander Hamilton founded his argument for a broad construction of the Constitution, in 1790, when the question of the constitutionality of the act chartering the United States Bank was raised in Washington's cabinet. Thomas Jefferson, arguing for a strict construction of the Constitution, contended that the enumerated powers do not include authority for Congress to establish a bank. Hamilton argued that the enumerated powers include congressional competence to borrow money on the credit of the United States and that the bank would serve as the agency of the government in the performance of the borrowing function. He held that under the "Necessary and Proper Clause" Congress had power to create such an agency. Hamilton's logic won the approval of Washington, who signed the bill. Later the Supreme Court adopted the Hamiltonian view of the "Necessary and Proper Clause." This was done in the case of *McCulloch* v. *Maryland* in 1819, wherein the Court said: "Let the end be legitimate, let it be within the scope of the Constitution, and all means which are appropriate, which are plainly adapted to that end, which are not prohibited, but consistent with the letter and spirit of the Constitution, *are constitutional.*"

Limitations. Section 9 consists of certain specific limitations imposed on the powers of Congress. Most of them safeguard individual rights. Indeed, the section is a short bill of rights embedded in the important article on legislative power. Clause 2 provides that "the privilege of the writ of habeas corpus shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it." This palladium of freedom, which is often traced back to the Magna Charta in English history, was vividly in the thoughts of the framers of the Constitution because of their experience with the arbitrary arrests of American patriots on orders of the British crown on the eve of the American Revolution. President Lincoln's suspension of the right of habeas corpus without the consent of Congress was the only time this great fundamental liberty was taken away from American citizens. Ex post facto laws are prohibited. Capitation (poll taxes) and direct taxes, as well as export taxes, are limited. Titles of nobility are proscribed.

Section 10 lays prohibitions on the states, which are barred from making treaties with foreign powers; from coining money; from making anything other than gold or silver coin legal tender; and from enacting bills of attainder, ex post facto laws, or any law impairing the obligation of contract. No state, without the consent of Congress, may levy import or export tariffs except those necessary for its own inspection laws.

Investigative Power. The Supreme Court has held that the authority of each house of Congress to make investigations is an inherent power possessed by the legislatures of all modern democracies. In other words, each house has all the authority necessary for lawmaking, such as the power to authorize investigations by its committees looking to possible enactment of laws within the scope of the powers of Congress. Such committees have the power to examine witnesses and take testimony, while Congress may punish recalcitrant witnesses for contempt. An early case on this subject was *Anderson* v. *Dunn* in 1821 and a later case, *United States* v. *Bryan* in 1950.

Executive Powers

Article II begins with the sweeping generalization: "The executive power shall be vested in a President of the United States of America." This phraseology has precipitated a long controversy in American constitutional law. Do these words simply confer on the President his title as chief executive? Or do they mean that the President holds the powers inherent in the task of administering the executive office? The latter view is often called the "executive power" theory.

Historical Use. The question was raised in Congress as early as 1789, when the bill for creating executive departments, each under a secretary of the department, was debated in Congress. The bill followed the Constitution in providing for the appointment of heads of the departments by the President with confirmation by the Senate. The bill also contained a provision empowering the President to dismiss such officers without the consent of the Senate, although the Constitution says nothing on the removal power. James Madison, a member of the Philadelphia Convention and then a member of the House of Representatives, contended, with success, that the act should recognize the power of the President to remove the officer without seeking the consent of the Senate. Madison argued that the removal power was an inherent power which is requisite for efficient administration.

The question was raised again in 1793 in connection with President Washington's Proclamation of Neutrality. No authority is specifically granted in the Constitution authorizing the President to proclaim that the United States will remain impartial as between two belligerents engaged in war. Madison now reversed his position on the executive power theory and held that the President possessed no power to proclaim neutrality without authorization by Congress. Hamilton argued that this was a Presidential power clearly implied in the grant of executive power.

The controversy has continued up to the present day. In the first decade of the twentieth century Pres. Theodore Roosevelt asserted that the President, as the "steward of the people," had the duty of doing "anything that the needs of the Nation demanded unless such action was forbidden by the Constitution and the laws." President William Howard Taft, after leaving office, denounced the Rooseveltian view as making the President "a universal Providence." In 1940 Pres. Franklin D. Roosevelt went further than Pres. Theodore Roosevelt when he gave Great Britain 50 reconditioned naval destroyers without the consent of Congress. In doing so he violated Section 3 of Article IV of the Constitution giving Congress the sole power "to dispose of the property of the United States," as well as violating several statutes.

In 1952 in *Sawyer* v. *Youngstown Sheet and Tube Company*, the so-called Steel Seizure case, which grew out of President Harry Truman's order to seize the property of the company, the Supreme Court set limits to the President's inherent executive power.

Length of Term. Clause 1 of Section 1 also provides that both the President and the Vice-President shall be elected for a term of four years. The Constitution is silent on the question of eligibility of the President for re-election. Hamilton, however, in Essay No. 74 of *The Federalist*, makes clear that the Philadelphia Convention considered a President eligible for re-election. At a later date Jefferson questioned the advisability of indefinite eligibility, arguing that this practice might give the President a life tenure that would degenerate into inheritance of the office. President Washington settled the problem in 1796 by refusing a third election. This was the origin of the two-term tradition that continued for 140 years until its violation in 1940 by Pres. Franklin D. Roosevelt. In 1947 Congress moved to preserve the tradition by writing it into the Constitution. The proposal to limit election of the President to two terms became the Twenty-second Amendment in 1951.

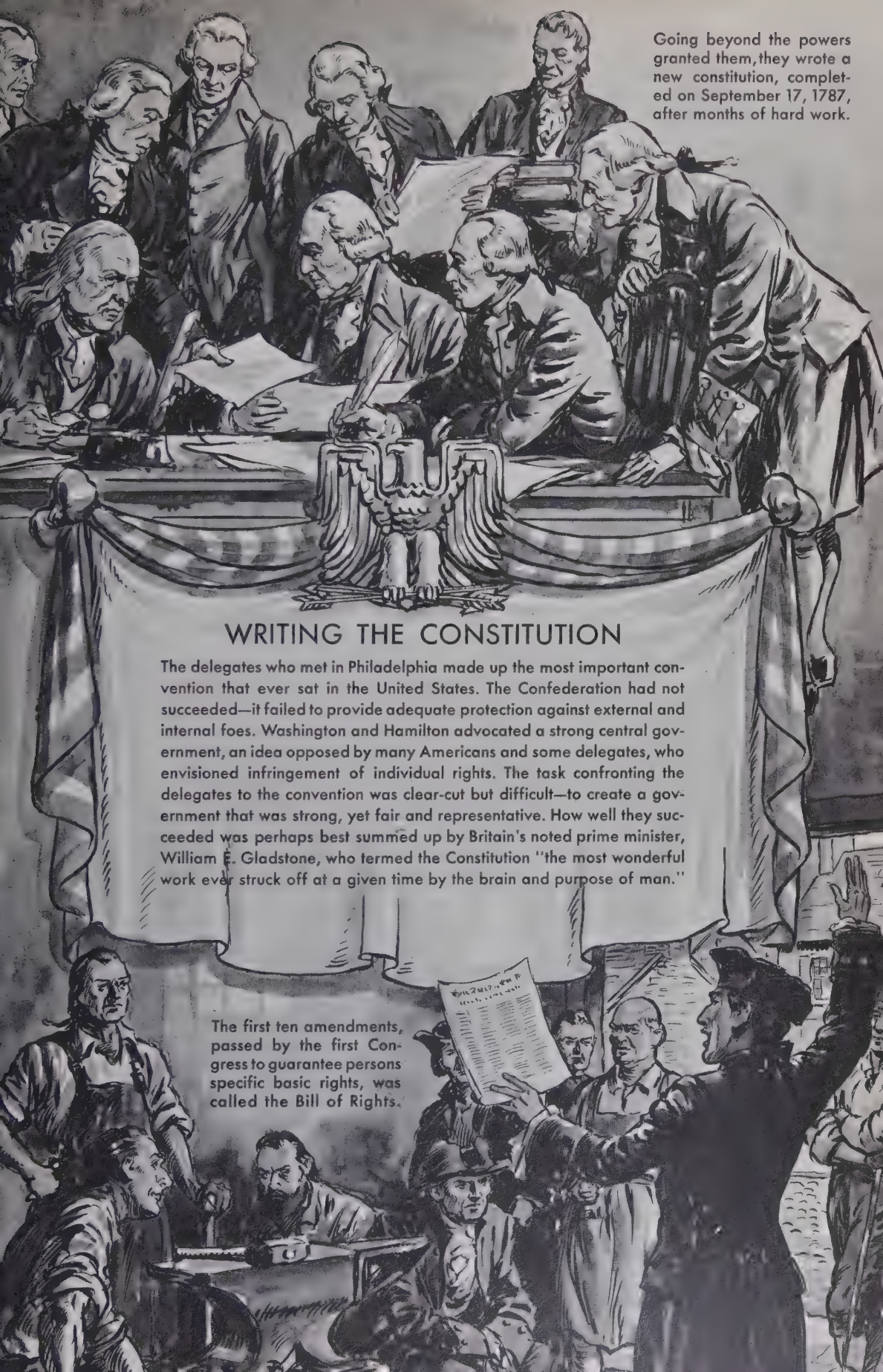
Electoral College. Clauses 2 and 3 of Section 1 established the Electoral College as the method for the election of the President and Vice-President. Every four years the legislature of each state was to provide for the appointment of as many presidential electors as the state had senators and representatives in Congress. After appointment, the presidential electors were to meet within their respective states and each elector was to cast two ballots for President and Vice-President, without designating one as President and the other as Vice-President. The ballots were then to be sent to the national capitol, and there the President of the Senate, in the presence of the Senate and the House of Representatives, was to open and count the ballots. The person with the next highest number was to be declared Vice-President, provided he had a majority. In case of a lack of a majority for the presidency, the House of Representatives was to decide among the five persons having the highest number of electoral votes. In case of a tie vote for the presidency, the House of Representatives was to resolve the tie. In both cases the vote in the House was to be by states, each state having one vote.

The defect in this system was discovered in 1800, when both Thomas Jefferson and Aaron Burr received the same number of electoral votes. It was obvious that the popular preference was for Jefferson and Hamilton saved the election for his old political opponent by influencing the House to elect Jefferson. This act of statesmanship led to a duel between Burr and Hamilton in which Hamilton was killed. In 1804 the defect in the electoral college was corrected by the Twelfth Amendment, which required the presidential electors to vote separately for the President and the Vice-President.

The fathers of the Constitution had intended that the presidential electors, as unrestricted representatives, should deliberate carefully on the selection of President and Vice-President and vote without instruction from the legislatures or anybody else. This procedure was followed in the first three presidential elections. But in the election of 1800, after the rise of political parties, the individual electors were pledged to vote for the candidates of their respective political parties. This practice continues to the present day. Each political party now holds a national nominating convention, every four years, which nominates its respective candidates for President and Vice-President. In the presidential elections in each state the voters cast their ballots for the list of presidential electors selected by their respective parties, each presidential elector being pledged to vote for the candidates nominated by his political party. In each state the presidential electors comprising the slate receiving the majority of popular votes in the election

Washington, admired and respected by all, was the unanimous choice for president of the convention, which convened at Carpenter Hall, in Philadelphia, May 1787.

Thirty-nine delegates signed the finished document. During the signing Benjamin Franklin, referring to the sun painted on the back of Washington's chair, said, "Now, at length, I have the happiness to know that it is a rising and not a setting sun."



Going beyond the powers granted them, they wrote a new constitution, completed on September 17, 1787, after months of hard work.

WRITING THE CONSTITUTION

The delegates who met in Philadelphia made up the most important convention that ever sat in the United States. The Confederation had not succeeded—it failed to provide adequate protection against external and internal foes. Washington and Hamilton advocated a strong central government, an idea opposed by many Americans and some delegates, who envisioned infringement of individual rights. The task confronting the delegates to the convention was clear-cut but difficult—to create a government that was strong, yet fair and representative. How well they succeeded was perhaps best summed up by Britain's noted prime minister, William E. Gladstone, who termed the Constitution "the most wonderful work ever struck off at a given time by the brain and purpose of man."

The first ten amendments, passed by the first Congress to guarantee persons specific basic rights, was called the Bill of Rights.

participate in the electoral college and cast the entire vote of the state for the candidates of their party.

The framers of the Constitution had intended an indirect method for the election of the President and Vice-President. Inasmuch as each political party wins all or none of the electoral votes in each state, it is possible for a candidate to be elected without a majority of the popular vote.

Presidential Succession. Clause 6 of Section I delegated to Congress the power to provide for Presidential succession. By the Presidential Succession Act of 1886, the order of succession devolved upon the Secretary of State and after him the other members of the President's cabinet in order of rank. In 1947 Congress placed the Speaker of the House of Representatives and President pro tempore of the Senate in the immediate order of succession, ahead of the cabinet officers.

The Constitution makes no provision for determining when a President is unable to discharge his duties. The acute illness of Pres. Woodrow Wilson in 1919 raised a constitutional problem which so far remains unsolved.

Clause 8 prescribes the oath of office that the President takes on assuming office. He swears to "preserve, protect and defend the Constitution."

Sections 2 and 3 of Article II are devoted to the powers of the President. In this respect they correspond to Section 8 of Article I, which defines the 18 powers of Congress. Sections 2 and 3 are as short as Section 8 of Article I is long. But when the doctrines of implied powers and inherent powers are applied to the various clauses of these two sections, the President's powers become as sweeping as those of Congress.

Commander in Chief. The first of the three parts of Section 2 reads: "The President shall be Commander-in-Chief of the Army and Navy [but not the air force] of the United States, and of the militia of the several States when called into the actual service of the United States." This power was viewed as rather limited in the early days of the Union. Hamilton, in Essay No. 69 of *The Federalist*, held that the power of commander in chief amounted to nothing more than supreme command of the military forces. The framers congratulated themselves that this command would remain in civilian rather than military hands. They did not foresee that the "implied powers" of the commander in chief might embrace powers of great political significance. For instance, under the Constitution, Congress alone has the power to declare war. But in 1846 President Polk, as commander in chief, without directions from Congress, ordered American troops to occupy the territory disputed with Mexico. The Mexican army attacked the Americans, and the President informed Congress that a state of war existed. Congress responded, as necessity required, by a declaration of war. In 1861, after the Northern refusal to withdraw from Fort Sumter precipitated the Southern attack on that fort, President Lincoln proclaimed a blockade of Southern ports. The Supreme Court, at a later date, declared that a public war existed from the date of the proclamation of the blockade.

During World War II the "total war" concept, developed in Europe in the gigantic struggle against Hitler, had repercussions even on American constitutional law. President Franklin D. Roosevelt claimed that as commander in chief in wartime he had powers which in peace would require authorization by Congress, but which, in national emergency, were exercisable by the President without congressional mandate. The seizure of the distributing plant of Montgomery Ward and Company in Chicago was a case in point. Jurists have warned, however, that the total war doctrine which destroyed a large part of international law could also destroy the Constitution of the United States.

The second part of Clause I requires the heads of the departments to report to the President. Although the Constitution has no mention of the President's cabinet, authorization for it is found in this clause. The second part of Clause 1 grants the pardoning power to the President.

Treaty-making Power. Clause 2 of Section 2 reads: "He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two-thirds of the Senators present concur." The records of the Philadelphia Convention of 1787 plainly show that the framers of the Constitution intended the President and the Senate to share the treaty-making power at every step in the process of negotiation and ratification of formal international agreements. This intent was the reason for using the stilted English legal phraseology "by and with the advice and consent of the Senate" in the text of the clause. The fathers of the Constitution expected the Senate to act as a continuing council to co-operate with the President in treaty making. In the spirit of the Constitution, President Washington came before the Senate in 1787 to seek advice and consent on the occasion of the negotiation of the first treaty to be made by the United States. The Senate, however, objected to the President's presence in its chamber and withheld oral advice. With considerable indignation, Washington strode from the chamber and never returned. When the time arrived to negotiate a new treaty with Great Britain he dispatched John Jay to London without asking the Senate what instructions Jay should carry.

Thus, the treaty-making power, without a constitutional amendment, became sharply divided. The President through his diplomatic agents negotiates the treaty with the agents of a foreign power, leaving the Senate to consent or withhold consent to its ratification. The Senate may even consent to ratification only in case of reservations. In such a situation the President may be compelled to reopen negotiations with the foreign power in order to secure acceptance of such reservations.

Consent to the ratification of treaties requires a two-thirds vote of the senators. But the Congress may authorize the President to make executive agreements with foreign powers by a resolution requiring only a majority vote of both houses. Some of these agreements may even change congressional acts. The agreements made by Secretary of State Cordell Hull by virtue of the Reciprocity Trade Agreements Act were of this nature. The President, on his own, may make numerous executive agreements without congressional authorization. The Yalta and Potsdam agreements are examples.

Appointive Power. Clause 2 concerns the appointing power. Aside from the President and Vice-President, all national civil officers are appointive. They comprise two classes, namely, "presidential officers" and "inferior officers." The appointment of the former requires nomination by the President and confirmation by the Senate. The Senate may, of course, withhold confirmation of any nomination by the President. Under Clause 3, inferior officers may be appointed by the President or his subordinates under conditions authorized by law. The Civil Service acts empower the Civil Service Commission to examine candidates and to certify lists of eligible candidates from which appointing officers may select persons for appointment.

Section 3 of Article II contains four parts. The first part authorizes the President "from time to time to give the Congress information on the state of the Union." This is the origin of the Annual Message to Congress on the State of the Union at the opening of each session of Congress. Presidents Washington and John Adams presented their annual messages in person. Jefferson and his successors sent written messages, read by the clerk. President Woodrow Wilson revived the practice of oral messages. The President may also, and frequently does, recommend specific measures to Congress.

The second part of Section 3 authorizes the President, on extraordinary occasions, to convene both houses or either one in special session. The third part provides that the President shall receive ambassadors and other public ministers. This authority is a natural consequence of his office as chief executive of the nation. The fourth part is a sweeping grant of power reading: "He shall take care that the laws be faithfully executed, and shall commission all officers of the United States." The President, of course, does not personally enforce the law; rather, he gives the orders directing his subordinates to do so. In emergencies, he may use the armed services to prevent disturbances or compel obedience to law.

Section 4 provides for impeachment. Treason is strictly defined in Section 3 of Article III of the Constitution.

Judicial Powers

General Powers. Article III completes the organization and powers of the national government by providing for the judicial branch. Section 1 vests the judicial power of the United States in "one Supreme Court and in such inferior courts as the Congress may from time to time ordain and establish." The Supreme Court in the case of *Marbury* v. *Madison* in 1803 held that judicial power means the authority to decide "cases" and "controversies" brought before the court, the decision to be in conformity with law and the procedure established by usages and principles of law.

As "inherent powers" are held to pertain to the legislature and the executive, so also certain "inherent powers" are found attached to the judiciary by the nature of its office. One of them not mentioned in the Constitution is the authority to punish contempt of court. Obviously, the judges cannot permit defiance and abuse of the judiciary in the presence of the court. During the trial of the 11 Communist leaders in a national court in New York in 1949, attorneys for the Communist defendants made scandalous attacks upon the presiding judge and upon the whole American judicial system in an attempt to disrupt the trial. Judge Harold Medina patiently bore these insults in order to show Communists everywhere that American courts extended to them even more than justice. At the end of the trial, however, he properly followed judicial tradition by sentencing the attorneys to fine and imprisonment. His conduct was upheld by the Supreme Court in the case of *Sacher* v. *United States* in 1952.

In conformity with the principle of separation of powers, the Philadelphia Convention provided for complete independence of the judiciary. Federal judges are accorded life tenure. They are not subject to recall, and can be removed only by impeachment. Furthermore, Congress cannot intimidate or influence any judge by reducing his salary. In 1935 an attempt by Pres. Franklin D. Roosevelt to "purge" the Supreme Court failed because of the refusal of Congress to pass the necessary legislation.

Specific Powers. Clause 1 of Section 2 lists nine categories of cases and controversies over which the judicial power extends. They include: (1) all cases in law and equity arising under the Constitution, national laws, and treaties; (2) all cases affecting ambassadors and other public ministers and consuls; (3) all cases of admiralty and maritime jurisdiction; (4) controversies to which the United States is a party; (5) controversies between two or more states; (6) controversies between a state and citizens of another state; (7) controversies between citizens of different states; (8) controversies between citizens of the same state claiming lands under grants of different states; and (9) controversies between a state, or the citizens thereof, and foreign states, citizens, or subjects.

In 1798 the judicial power of the national courts was altered by the Eleventh Amendment as the result of the case of *Chisholm* v. *Georgia*, 1793, in respect to the ninth category of cases and controversies. The amendment recognizes the principle that the state cannot be sued without its consent.

Clause 2 of Section 2 concerns the original and the appellate jurisdiction of the Supreme Court. It provides that only two categories of cases may come to the Supreme Court in the first instance, namely: cases affecting ambassadors, other public ministers, and consuls; and cases in which a state shall be party. All other cases, unless otherwise provided for by Congress, can come before the Supreme Court only on appeal from the lower courts.

Clauses 1 and 2 of Section 2 gave rise to the principle of judicial review established by the Supreme Court in the famous case of *Marbury* v. *Madison* in 1803. In that case Chief Justice John Marshall held that the courts are empowered to hear cases involving the Constitution and the acts of Congress, that the Constitution is the "paramount law," and hence that a "law repugnant to the Constitution is void." This principle of judicial review of legislative acts has governed the courts since 1803.

The third clause of Section 2 guarantees trial by jury in criminal cases. Section 3 defines treason.

Federal Relations. The first three articles of the Constitution having provided for the organs of the national government, Article IV is logically devoted to relations among the several states in the federal system.

Section 1, sometimes called the "Full Faith and Credit Clause," provides that "full faith and credit shall be given in each state to the public acts, records and judicial proceedings of every other state." Congress is given power to provide by law the manner in which such acts, records, and proceedings shall be proved.

Clause 1 of Section 2 provides that "the citizens of each state shall be entitled to all the privileges and immunities of citizens in the several states." Clause 2 requires a state to surrender to another state, on demand, an alleged criminal who flees to that state.

Section 3 provides for the admission of new states into the Union, and also guarantees the integrity of each of the several states. A second clause in the same section gives Congress the power to regulate and to dispose of all territory or property belonging to the United States wherever situated.

Section 4 provides: "The United States shall guarantee to every state in this Union a republican form of government."

Amending Power. In Article V the Constitution provides for amendment. It offers two methods for initiating amendments. First, Congress, by a two-thirds vote in both houses, may propose an amendment to the states or call a constitutional convention to propose an amendment or amendments to the states. Second, on application of two-thirds of the state legislatures, Congress must call a national constitutional convention. There are also two methods of ratification of amendments. First, Congress may provide that ratification of its proposed amendments or of the amendments of a national constitutional convention shall be by means of the state legislatures. Second, Congress may provide that ratification be in the hands of state conventions. In either case, if the proposed amendments are ratified by the legislatures or by the conventions in three fourths of the states, the proposed amendments become a part of the Constitution.

Of the 22 amendments added to the Constitution, all have been proposed by Congress. The usual ratifying process is by action of the state legislatures. In 1933, when submitting the proposed amendment to repeal the Eighteenth (Prohibition) Amendment, Congress provided that ratification be by state conventions.

Article V, containing the one restriction on amendments already mentioned, provides that no

amendment can be made of the compromise between the large and the small states without the assent of every state. The prohibition reads: "No State, without its consent, shall be deprived of its equal suffrage in the Senate."

Supremacy Clause. There are several provisions of the Constitution that do not fit logically into the preceding five articles. These are appropriately grouped together under Article VI. Clause 1 provides that all debts and engagements of the Confederation of United States that preceded the Union be assumed by the United States.

Clause 2 is the famous "Supremacy Clause." It provides that "This Constitution, and the laws of the United States which shall be made in pursuance thereof, and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land." The records of the Philadelphia Convention, of *The Federalist*, and of early decisions of the courts show that the intent was to keep the Constitution on a higher level of authority over acts of Congress or treaties. There was no intent that an act of Congress or a treaty in conflict with a provision of the Constitution would be valid. This view was expressed by Thomas Jefferson in his *Manual of Parliamentary Practice*, where, in reference to the treaty-making power, he held the Constitution to mean that "the President and the Senate cannot do by treaty what the whole government is interdicted from doing in any way."

For more than 100 years the Supreme Court interpreted the Supremacy Clause in a manner to place treaties merely on a par with acts of Congress. In such cases as the head money cases in 1884 and the Chinese exclusion case in 1889, the court held that a subsequent act of Congress could repeal the legal effect of a treaty within the United States, while a subsequent treaty could annul an act of Congress.

In 1923 Justice Holmes in the case of *Missouri* v. *Holland* laid down a doctrine that greatly extended the power of the President and the Senate through treaties to sweep aside the powers reserved to the people of the states under the Tenth Amendment. In succeeding years the Supreme Court showed a disposition to follow this doctrine. In 1952 proposals pending before the United Nations Organization, supported by the Department of State, and looking toward a multipartite treaty requiring uniform rights of persons regardless of national law, aroused widespread apprehension in the United States. As a result, for several years the U.S. Senate had under consideration a constitutional amendment proposed by Sen. John W. Bricker of Ohio providing that any provision of a treaty that conflicts with the Constitution shall have no force or effect.

Clause 3 requires that senators and representatives and members of all state legislatures, and all executive and judicial officers of the United States and of the several states, shall be bound by oath to support the Constitution.

Ratification of the Constitution. Article VII provided that the Constitution would go into effect upon ratification of it by nine states. The Philadelphia Convention referred the proposed Constitution to the Congress of the Confederation then sitting in New York. The Congress almost immediately submitted the document to the states for ratification or rejection. Within the states, conventions were elected to consider the proposed Constitution. By 1788, 11 states had ratified. On September 13, 1788, the Congress of the Confederation passed a resolution to put the new Constitution into effect. North Carolina ratified the Constitution in 1789, and Rhode Island the following year. Certain states, however, ratified the Constitution on the condition that the states reserved the right to reassume powers delegated to the federal government. Yet, all of this was done in orderly manner and in no way to justify any opinion that adoption of the Constitution was achieved by a revolution.

The Amendments

Background for the First Ten. The records of the Philadelphia Convention show that the question of a bill of rights was considered on several occasions. Many of the delegates agreed with Roger Sherman of Connecticut, a fervent defender of freedom, that a national bill of rights was not required inasmuch as liberties were already guaranteed under the state constitutions. To most of the members of the Convention the problem of liberty was directly involved in protecting the rights of the several states as the guardians of local self government. In their view individual liberty would be best protected by obtaining a federal government wherein freedom would be safeguarded by separation of powers and limitations upon power. Finally, throughout the various articles of the Constitution, many individual rights were guaranteed, such as the writ of habeas corpus and prohibitions upon ex post facto laws and bills of attainder. Trial by jury in case of federal crimes was guaranteed. Treason was strictly defined in order to prevent the abuses which had frequently occurred in English history.

The lack of a bill of rights, however, was a defect that nearly prevented the ratification of the Constitution in some of the state conventions. Indeed, in several states, ratification was secured only on solemn pledges by Federalists that they would seek to obtain immediate amendment of the Constitution, adding to it a comprehensive bill of rights. The Virginia ratifying convention, in which James Madison led the Federalists, adopted a list of 40 amendments to serve as a bill of rights and enjoined the Virginia delegation in the new Congress to press for their adoption by Congress as proposed amendments to the Constitution.

James Madison was elected as a member from Virginia to the new House of Representatives. In Congress he assumed leadership of the movement to redeem the pledge of the Federalists regarding a bill of rights. Personally he redrafted the text of the large number of proposals, reducing them to 17 amendments. After considerable debate the House of Representatives adopted these resolutions by a two-thirds vote. In the Senate the amendments of the House were re-edited and combined into 12 amendments. These revisions were finally adopted by both houses and sent to the state legislatures for ratification. The legislatures of three-fourths of the states ratified 10 of the proposed amendments, and in 1791 they went into effect as the First Ten Amendments. The Federalists had kept their pledge to the Anti-Federalists.

The Bill of Rights. The first eight of the First Ten Amendments guarantee specific rights to individuals. The Ninth Amendment refers to unspecified rights retained by the people, while the Tenth refers to rights reserved to the states respectively or to the people. All of the rights mentioned in the First Ten Amendments are restrictions upon the powers of the federal government.

First Amendment. There are three fundamental guarantees of personal liberties in the First Amendment. Congress shall make no law: (1) respecting an establishment of religion, or prohibiting the free exercise thereof; (2) or abridging the freedom of speech or of the press; (3) or abridging the right of the people peaceably to assemble and to petition the government for a redress of grievances.

Second Amendment. This, the Bearing Arms Amendment, provides that "the right of the people to keep and bear arms shall not be infringed." This amendment reflects the pioneer character of the early republic when every able-bodied man belonged to the militia.

Third Amendment. This amendment, prohibiting the quartering of soldiers in any house without the consent of the owner except in a manner prescribed by law, is consistent with American tradition.

Fourth Amendment. This, the Searches and Seizure Amendment, guarantees "the right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures."

Fifth Amendment. This amendment stipulates that no person shall be: (1) held to answer for a capital, or other infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval (but not air) forces, or in the militia, when in actual service in time of war or public danger; (2) be subject for the same offense to be twice put in jeopardy of life or limb; (3) be compelled in any criminal case to be a witness against himself; (4) be deprived of life, liberty, or property without due process of law; and (5) nor shall private property be taken for public use, without just compensation.

Sixth Amendment. This amendment concerns the rights of the accused in a criminal prosecution in the federal courts. It provides five guarantees. In all criminal prosecutions the accused shall enjoy the right: (1) to a speedy and public trial, by an impartial jury of the state and district wherein the crime shall have been committed, which district shall have been previously ascertained by law; (2) to be informed of the nature and cause of the accusation; (3) to be confronted with witnesses against him (the right of confrontation); (4) to have compulsory process for obtaining witnesses in his favor; and (5) to have the assistance of counsel for his defense. All of these guarantees were found in the common law at the time that the amendment was adopted, and all were in the bills of rights of most of the new states.

Seventh Amendment. Rights in civil trials are guaranteed by the Seventh Amendment, which provides: (1) in suits at common law, where the value in controversy shall exceed $20, the right of trial by jury shall be preserved; and (2) no fact tried by a jury shall be re-examined in any court of the United States otherwise than according to the rules of common law. In interpreting this amendment the Supreme Court has ruled that parties to a suit have a right by stipulation to waive a jury and to submit the case to the court.

Eighth Amendment. Guarantees regarding punishment for crime are contained in the Eighth Amendment, which reads: "Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted."

Ninth Amendment. This amendment admits that there may be other fundamental human rights upon which no government should trespass.

Tenth Amendment. This amendment, frequently called the Reserved State Powers Amendment, was intended to be a limitation on the usurpation of powers by the federal government.

Eleventh Amendment. This amendment, proclaimed in 1798, barred suits against states. See *Specific Powers* above, Article III, Section 2.

Twelfth Amendment. The change in voting in the Electoral College was provided by the Twelfth Amendment, proclaimed in 1804. See *Electoral College* above, Article II, Section 1.

Thirteenth Amendment. This was the first of the Civil War amendments. Proclaimed in 1865, it abolished slavery.

Fourteenth Amendment. The second Civil War Amendment was proclaimed in 1868. While its main purpose was to guarantee the civil rights of the freedmen, the text of the principal section is couched in general terms that were intended by the lawmakers to have a broad application. Section 1 contains four provisions: (1) All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the state wherein they reside; (2) no state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; (3) nor shall any state deprive any person of life, liberty, or property without due process of law; (4) nor deny to any person within its jurisdiction the equal protection of the law.

Fifteenth Amendment. This, the last of the three Civil War amendments, was proclaimed in 1870. It provides: "The rights of citizens of the United States to vote shall not be abridged by the United States or by any State on account of race, color or previous condition of servitude."

Sixteenth Amendment. Proclaimed in 1913, the Sixteenth Amendment was intended to overrule the decision of the Supreme Court which in the case of *Pollock* v. *Farmers Loan and Trust Company*, 1895, had held the income tax law of Congress, passed in 1894, to be unconstitutional. It ended the controversy growing out of Article 1, Section 2, Clause 3, of the Constitution, which required that direct taxes should be apportioned among the several states according to population.

Seventeenth Amendment. This amendment, proclaimed in 1913, requires the popular election of the two senators from each state. See *Congress* above, Article 1, Section 3.

Eighteenth Amendment. This, the Prohibition Amendment, was proclaimed in 1919. It had been submitted to the states during World War I. The amendment forbade the manufacture, sale, or transportation of intoxicating liquors and provided that "Congress and the several states shall have concurrent power to enforce this article with appropriate legislation." The Volstead Act, passed by Congress in 1919 to enforce the amendment, proved exceedingly difficult to administer.

Nineteenth Amendment. This is the Woman Suffrage Amendment, proclaimed in 1920.

Twentieth Amendment. Proclaimed in 1933, the Twentieth Amendment eliminated the awkward gap between the time of election of the President and congressmen and the beginning of their terms of offices. These terms heretofore had begun on March 4 following the election in November. The terms of the President and Vice-President now begin on January 20 following their election. The terms of senators and representatives begin on January 3.

Twenty-first Amendment. Proclaimed in 1933, this amendment repealed the Prohibition Amendment.

Twenty-second Amendment. This, the Presidential Tenure Amendment, proclaimed in 1951, restored the American tradition of limiting a President to two terms of office. See *Length of Term* above, Article II, Section 1, Clause 1. KENNETH COLEGROVE

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We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common Defence, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

Article. I.

Section. 1. All legislative Powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section. 2. The House of Representatives shall be composed of Members chosen every second Year by the People of the several States, and the Electors in each State shall have the Qualifications requisite for Electors of the most numerous Branch of the State Legislature.

No Person shall be a Representative who shall not have attained to the Age of twenty five Years, and been seven Years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State in which he shall be chosen.

Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers, which shall be determined by adding to the whole Number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three fifths of all other Persons. The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct. The Number of Representatives shall not exceed one for every thirty Thousand, but each State shall have at Least one Representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to chuse three, Massachusetts eight, Rhode-Island and Providence Plantations one, Connecticut five, New-York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

When vacancies happen in the Representation from any State, the Executive Authority thereof shall issue Writs of Election to fill such Vacancies.

The House of Representatives shall chuse their Speaker and other Officers; and shall have the sole Power of Impeachment.

Section 3. The Senate of the United States shall be composed of two Senators from each State, chosen by the Legislature thereof, for six Years; and each Senator shall have one Vote.

Immediately after they shall be assembled in Consequence of the first Election, they shall be divided as equally as may be into three Classes. The Seats of the Senators of the first Class shall be vacated at the Expiration of the second Year, of the second Class at the Expiration of the fourth Year, and of the third Class at the Expiration of the sixth Year, so that one third may be

Text of the Constitution. The Constitution of the United States is divided into seven articles, supplemented by 22 amendments. Above is shown a facsimile of the Preamble and part of Article I. The concluding articles of the Constitution are reproduced in facsimile at the end of the printed text, which follows in the original spelling and punctuation.

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The House of Representatives shall chuse their Speaker and other Officers; and shall have the sole Power of Impeachment.

Section 3. The Senate of the United States shall be composed of two Senators from each State, chosen by the Legislature thereof, for six Years; and each Senator shall have one Vote.

Immediately after they shall be assembled in Consequence of the first Election, they shall be divided as equally as may be into three Classes. The Seats of the Senators of the first Class shall be vacated at the Expiration of the second Year, of the second Class at the Expiration of the fourth Year, and of the third Class at the Expiration of the sixth Year, so that one third may be

chosen every second Year; and if Vacancies happen by Resignation, or otherwise, during the Recess of the Legislature of any State, the Executive thereof may make temporary Appointments until the next Meeting of the Legislature, which shall then fill such Vacancies.

No Person shall be a Senator who shall not have attained to the Age of thirty Years, and been nine Years a Citizen of the United States, and who shall not, when elected, be an Inhabitant of that State for which he shall be chosen.

The Vice President of the United States shall be President of the Senate, but shall have no Vote, unless they be equally divided.

The Senate shall chuse their other Officers, and also a President pro tempore, in the Absence of the Vice President, or when he shall exercise the Office of President of the United States.

The Senate shall have the sole Power to try all Impeachments. When sitting for that Purpose, they shall be on Oath or Affirmation. When the President of the United States is tried, the Chief Justice shall preside: And no Person shall be convicted without the Concurrence of two thirds of the Members present.

Judgment in Cases of Impeachment shall not extend further than to removal from Office, and disqualification to hold and enjoy any Office of honor, Trust or Profit under the United States: but the Party convicted shall nevertheless be liable and subject to Indictment, Trial, Judgment and Punishment, according to Law.

Section 4. The Times, Places and Manner of holding Elections for Senators and Representatives, shall be prescribed in each State by the Legislature thereof; but the Congress may at any time by Law make or alter such Regulations, except as to the Places of chusing Senators.

The Congress shall assemble at least once in every Year, and such Meeting shall be on the first Monday in December, unless they shall by Law appoint a different Day.

Section 5. Each House shall be the Judge of the Elections, Returns and Qualifications of its own Members, and a Majority of each shall constitute a Quorum to do Business; but a smaller Number may adjourn from day to day, and may be authorized to compel the Attendance of absent Members, in such Manner, and under such Penalties as each House may provide.

Each House may determine the Rules of its Proceedings, punish its Members for disorderly Behaviour, and, with the Concurrence of two thirds, expel a Member.

Each House shall keep a Journal of its Proceedings, and from time to time publish the same, excepting such Parts as may in their Judgment require Secrecy; and the Yeas and Nays of the Members of either House on any question shall, at the Desire of one fifth of those Present, be entered on the Journal.

Neither House, during the Session of Congress, shall, without the Consent of the other, adjourn for more than three days, nor to any other Place than that in which the two Houses shall be sitting.

Section 6. The Senators and Representatives shall receive a Compensation for their Services, to be ascertained by Law, and paid out of the Treasury of the United States. They shall in all Cases, except Treason, Felony and Breach of the Peace, be privileged from Arrest during their Attendance at the Session of their respective Houses, and in going to and returning from the same; and for any Speech or Debate in either House, they shall not be questioned in any other Place.

No Senator or Representative shall, during the Time for which he was elected, be appointed to any civil Office under the Authority of the United States, which shall have been created, or the Emoluments whereof shall have been encreased during such time; and no Person holding any Office under the United States, shall be a Member of either House during his Continuance in Office.

Section 7. All Bills for raising Revenue shall originate in the House of Representatives; but the Senate may propose or concur with Amendments as on other Bills.

Every Bill which shall have passed the House of Representatives and the Senate, shall, before it become a Law, be presented to the President of the United States; If he approve he shall sign it, but if not he shall return it, with his Objections to that House in which it shall have originated, who shall enter the Objections at large on their Journal, and proceed to reconsider it. If after such Reconsideration two thirds of that House shall agree to pass the Bill, it shall be sent, together with the Objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a Law. But in all such Cases the Votes of both Houses shall be determined by yeas and Nays, and the Names of the Persons voting for and against the Bill shall be entered on the Journal of each House respectively. If any Bill shall not be returned by the President within ten Days (Sundays excepted) after it shall have been presented to him, the Same shall be a Law, in like Manner as if he had signed it, unless the Congress by their Adjournment prevents its Return, in which Case it shall not be a Law.

Every Order, Resolution, or Vote to which the Concurrence of the Senate and House of Representatives may be necessary (except on a question of Adjournment) shall be presented to the President of the United States; and before the Same shall take Effect, shall be approved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the Rules and Limitations prescribed in the Case of a Bill.

Section 8. The Congress shall have Power To lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States; but all Duties, Imposts and Excises shall be uniform throughout the United States;

To borrow Money on the credit of the United States;

To regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes;

To establish an uniform Rule of Naturalization, and uniform Laws on the subject of Bankruptcies throughout the United States;

To coin Money, regulate the Value thereof, and of foreign Coin, and fix the Standard of Weights and Measures;

To provide for the Punishment of counterfeiting the Securities and current Coin of the United States;

To establish Post Offices and post Roads;

To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;

To constitute Tribunals inferior to the supreme Court;

To define and punish Piracies and Felonies committed on the high Seas, and Offences against the Law of Nations;

To declare War, grant Letters of Marque and Reprisal, and make Rules concerning Captures on Land and Water;

To raise and support Armies, but no Appropriation of Money to that Use shall be for a longer Term than two Years;

To provide and maintain a Navy;

To make Rules for the Government and Regulation of the land and naval Forces;

To provide for calling forth the Militia to execute the Laws of the Union, suppress Insurrections and repel Invasions;

To provide for organizing, arming, and disciplining, the Militia, and for governing such Part of them as may be employed in the Service of the United States, reserving to the States respectively, the Appointment of the Officers, and the Authority of training the Militia according to the discipline prescribed by Congress;

To exercise exclusive Legislation in all Cases whatsoever, over such District (not exceeding ten Miles square) as may, by Cession of particular States, and the Acceptance of Congress, become the Seat of the Government of the United States, and to exercise like Authority over all Places purchased by the Consent of the Legislature of the State in which the Same shall be, for the Erection of Forts, Magazines, Arsenals, dock-Yards, and other needful Buildings;—And

To make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.

Section 9. The Migration or Importation of such Persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the Year one thousand eight hundred and eight, but a Tax or duty may be imposed on such Importation, not exceeding ten dollars for each Person.

The Privilege of the Writ of Habeas Corpus shall not be suspended, unless when in Cases of Rebellion or Invasion the Public Safety may require it.

No Bill of Attainder or ex post facto Law shall be passed.

No Capitation, or other direct, Tax shall be laid, unless in Proportion to the Census or Enumeration herein before directed to be taken.

No Tax or Duty shall be laid on Articles exported from any State.

No Preference shall be given by any Regulation of Commerce or Revenue to the Ports of one State over those of another: nor shall Vessels bound to, or from, one State, be obliged to enter, clear, or pay Duties in another.

No Money shall be drawn from the Treasury, but in Consequence of Appropriations made by Law; and a regular Statement and Account of the Receipts and Expenditures of all public Money shall be published from time to time.

No Title of Nobility shall be granted by the United States: And no Person holding any Office of Profit or Trust under them, shall, without the Consent of the Congress, accept of any present, Emolument, Office, or Title, of any kind whatever, from any King, Prince, or foreign State.

Section 10. No State shall enter into any Treaty, Alliance, or Confederation; grant Letters of Marque and Reprisal; coin Money; emit Bills of Credit; make any Thing but gold and silver Coin a Tender in Payment of Debts; pass any Bill of Attainder, ex post facto Law, or Law impairing the Obligation of Contracts, or grant any Title of Nobility.

No State shall, without the Consent of the Congress, lay any Imposts or Duties on Imports or Exports, except what may be absolutely necessary for executing it's inspection Laws: and the net Produce of all Duties and Imposts, laid by any State on Imports or Exports, shall be for the Use of the Treasury of the United States; and all such Laws shall be subject to the Revision and Controul of the Congress.

No State shall, without the Consent of Congress, lay any Duty of Tonnage, keep Troops, or Ships of War in time of Peace, enter into any Agreement or Compact with another State, or with a foreign Power, or engage in War, unless actually invaded, or in such imminent Danger as will not admit of delay.

Article II.

Section 1. The executive Power shall be vested in a President of the United States of America. He shall hold his Office during the Term of four Years, and, together with the Vice President, chosen for the same Term, be elected, as follows

Each State shall appoint, in such Manner as the Legislature thereof may direct, a Number of Electors, equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress: but no Senator or Representative, or Person holding an Office of Trust or Profit under the United States, shall be appointed an Elector.

The Electors shall meet in their respective States, and vote by Ballot for two Persons, of whom one at least shall not be an Inhabitant of the same State with themselves. And they shall make a List of all the Persons voted for, and of the Number of Votes for each; which List they shall sign and certify, and transmit sealed to the Seat of the Government of the United States, directed to the President of the Senate. The President of the Senate shall, in the Presence of the Senate and House of Representatives, open all the Certificates, and the Votes shall then be counted. The Person having the greatest Number of Votes shall be the President, if such Number be a Majority of the whole Number of Electors appointed; and if there be more than one who have such Majority, and have an equal Number of Votes, then the House of Representatives shall immediately chuse by Ballot one of them for President; and if no Person have a Majority, then from the five highest on the List the said House shall in like Manner chuse the President. But in choosing the President, the Votes shall be taken by States, the Representation from each State having one Vote; A quorum for this Purpose shall consist of a Member or Members from two thirds of the States, and a Majority of all the states shall be necessary to a Choice. In every Case, after the Choice of the President, the Person having the greatest Number of Votes of the Electors shall be the Vice President. But if there should remain two or more who have equal Votes, the Senate shall chuse from them by Ballot the Vice President.

The Congress may determine the Time of chusing the Electors, and the Day on which they shall give their Votes; which Day shall be the same throughout the United States.

No Person except a natural born Citizen, or a Citizen of the United States, at the time of the Adoption of this Constitution, shall be eligible to the Office of President; neither shall any Person be eligible to that Office who shall not have attained to the Age of thirty five Years, and been fourteen Years a Resident within the United States.

In Case of the Removal of the President from Office, or of his Death, Resignation, or Inability to discharge the Powers and Duties of the said Office, the Same shall devolve on the Vice President, and the Congress may by Law provide for the Case of Removal, Death, Resignation or Inability, both of the President and Vice President, declaring what Officer shall then act as President, and such Officer shall act accordingly, until the Disability be removed, or a President shall be elected.

The President shall, at stated Times receive for his Services, a Compensation, which shall neither be encreased nor diminished during the Period for which he shall have been elected, and he shall not receive within that Period any other Emolument from the United States, or any of them.

Before he enter on the Execution of his Office, he shall take the following Oath or Affirmation:—"I do solemnly swear (or affirm) that I will faithfully execute the Office of President of the United States, and will to the best of my Ability, preserve, protect and defend the Constitution of the United States."

Section 2. The President shall be Commander in Chief of the Army and Navy of the United States, and of the Militia of the several States, when called into the actual Service of the United States; he may require the Opinion, in writing, of the principal Office in each of the executive Departments, upon any Subject relating to the Duties of their respective Offices, and he shall have Power to grant Reprieves and Pardons for Offences against the United States, except in Cases of Impeachment.

He shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur; and he shall nominate, and by and with the Advice and Consent of the Senate, shall appoint Ambassadors, other public Ministers and Consuls, Judges of the supreme Court, and all other Officers of the United States, whose Appointments are not herein otherwise provided for, and which shall be established by Law: but the Congress may by Law vest the Appointment of such inferior Officers, as they think proper, in the President alone, in the Courts of Law, or in the Heads of Departments.

The President shall have Power to fill up all Vacancies that may happen during the Recess of the Senate, by granting Commissions which shall expire at the End of their next Session.

Section 3. He shall from time to time give to the Congress Information of the State of the Union, and recommend to their Consideration such Measures as he shall judge necessary and expedient; he may, on extraordinary Occasions, convene both Houses, or either of them, and in Case of Disagreement between them, with Respect to the Time of Adjournment, he may adjourn them to such Time as he shall think proper; he shall receive Ambassadors and other public Ministers; he shall take Care that the Laws be faithfully executed, and shall Commission all the Officers of the United States.

Section 4. The President, Vice President and all civil Officers of the United States, shall be removed from Office on Impeachment for, and Conviction of, Treason, Bribery, or other high Crimes and Misdemeanors.

Article III.

Section 1. The judicial Power of the United States, shall be vested in one supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish. The Judges, both of the supreme and inferior Courts, shall hold their Offices during good Behaviour, and shall, at stated Times, receive for their Services, a Compensation, which shall not be diminished during their Continuance in Office.

Section 2. The judicial Power shall extend to all Cases, in Law and Equity, arising under this Constitution, the Laws of the United States, and Treaties made, or which shall be made, under their Authority;—to all Cases affecting Ambassadors, other public Ministers and Consuls;—to all Cases of admiralty and maritime Jurisdiction;—to Controversies to which the United States shall be a Party;—to Controversies between two or more States;—between a State and Citizens of another State;—between Citizens of different States;—between Citizens of the same State claiming Lands under Grants of different States, and between a State, or the Citizens thereof, and foreign States, Citizens or Subjects.

In all Cases affecting Ambassadors, other public Ministers and Consuls, and those in which a State shall be Party, the supreme Court shall have original Jurisdiction. In all the other Cases before mentioned, the supreme Court shall have appellate Jurisdiction, both as to Law and Fact, with such Exceptions, and under such Regulations as the Congress shall make.

The Trial of all Crimes, except in Cases of Impeachment, shall be by Jury; and such Trial shall be held in the State where the said Crimes shall have been committed; but when not committed within any State, the Trial shall be at such Place or Places as the Congress may by Law have directed.

Section 3. Treason against the United States, shall consist only in levying War against them, or in adhering to their Enemies, giving them Aid and Comfort. No Person shall be convicted of Treason unless on the Testimony of two Witnesses to the same overt Act, or on Confession in open Court.

The Congress shall have Power to declare the Punishment of Treason, but no Attainder of Treason shall work Corruption of Blood, or Forfeiture except during the Life of the Person attainted.

Article IV.

Section 1. Full Faith and Credit shall be given in each State to the public Acts, Records, and judicial Proceedings of every other State. And the Congress may by general Laws prescribe the Manner in which such Acts, Records and Proceedings shall be proved, and the effect thereof.

SECTION 2. The Citizens of each State shall be entitled to all Privileges and Immunities of Citizens in the several States.

A Person charged in any State with Treason, Felony, or other Crime, who shall flee from Justice, and be found in another State, shall on Demand of the executive Authority of the State from which he fled, be delivered up, to be removed to the State having Jurisdiction of the Crime.

No Person held to Service or Labour in one State, under the Laws thereof, escaping into another, shall, in Consequence of any Law or Regulation therein, be discharged from such Service or Labour, but shall be delivered up on Claim of the Party to whom such Service or Labour may be due.

SECTION 3. New States may be admitted by the Congress into this Union; but no new State shall be formed or erected within the Jurisdiction of any other State; nor any State be formed by the Junction of two or more States, or Parts of States, without the Consent of the Legislatures of the States concerned as well as of the Congress.

The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States; and nothing in this Constitution shall be so construed as to Prejudice any Claims of the United States, or of any particular State.

SECTION 4. The United States shall guarantee to every State in this Union a Republican Form of Government, and shall protect each of them against Invasion; and on Application of the Legislature, or of the Executive (when the Legislature cannot be convened) against domestic Violence.

ARTICLE V.

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose Amendments to this Constitution, or, on the Application of the Legislatures of two thirds of the several States, shall call a Convention for proposing Amendments, which, in either Case, shall be valid to all Intents and Purposes, as Part of this Constitution, when ratified by the Legislatures of three fourths of the several States, or by Conventions in three fourths thereof, as the one or the other Mode of Ratification may be proposed by the Congress; Provided that no Amendment which may be made prior to the Year One thousand eight hundred and eight shall in any Manner affect the first and fourth Clauses in the Ninth Section of the first Article; and that no State, without its Consent, shall be deprived of its equal Suffrage in the Senate.

ARTICLE VI.

All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

The Senators and Representatives before mentioned, and the Members of the several State Legislatures, and all executive and judicial Officers, both of the United States and of the several States, shall be bound by Oath or Affirmation, to support this Constitution; but no religious Test shall ever be required as a Qualification to any Office or public Trust under the United States.

ARTICLE VII.

The Ratification of the Conventions of nine States, shall be sufficient for the Establishment of this Constitution between the States so ratifying the Same.

Done in Convention by the Unanimous Consent of the States present the Seventeenth Day of September in the Year of our Lord one thousand seven hundred and Eighty seven and of the Independance of the United States of America the Twelfth In witness whereof We have hereunto subscribed our Names,

Attest WILLIAM JACKSON
Secretary

GO WASHINGTON—Presidt
and deputy from Virginia

New Hampshire—JOHN LANGDON, NICHOLAS GILMAN.

Massachusetts—NATHANIEL GORHAM, RUFUS KING.

Connecticut—WM SAML JOHNSON, ROGER SHERMAN.

New York—ALEXANDER HAMILTON.

New Jersey—WIL: LIVINGSTON, DAVID BREARLEY, WM PATERSON, JONA: DAYTON.

Pennsylvania—B. FRANKLIN, THOMAS MIFFLIN, ROBT MORRIS, GEO CLYMER, THOS FITZ-SIMONS, JARED INGERSOLL, JAMES WILSON, GOUV MORRIS.

Delaware—GEO: READ, GUNNING BEDFORD jun., JOHN DICKINSON, RICHARD BASSETT, JACO: BROOM.

Maryland—JAMES MCHENRY, DAN OF ST. THOS JENIFER, DANL CARROLL.

Virginia—JOHN BLAIR, JAMES MADISON JR.

North Carolina—WM BLOUNT, RICHD DOBBS SPAIGHT, HU WILLIAMSON.

South Carolina—J. RUTLEDGE, CHARLES COTESWORTH PINCKNEY, CHARLES PINCKNEY, PIERCE BUTLER.

Georgia—WILLIAM FEW, ABR BALDWIN.

In Convention Monday September 17th 1787.

Present The States of New Hampshire, Massachusetts, Connecticut, Mr Hamilton from New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina and Georgia. Resolved,

That the preceeding Constitution be laid before the United States in Congress assembled, and that it is the Opinion of this Convention, that it should afterwards be submitted to a Convention of Delegates, chosen in each State by the People thereof, under the Recommendation of its Legislature, for their Assent and Ratification; and that each Convention assenting to, and ratifying the Same, should give Notice thereof to the United States in Congress assembled.

Resolved, That it is the Opinion of this Convention, that as soon as the Conventions of nine States shall have ratified this Constitution, the United States in Congress assembled should fix a Day on which Electors should be appointed by the States which shall have ratified the same, and a Day on which the Electors should assemble to vote for the President, and the Time and Place for commencing Proceedings under this Constitution. That after such Publication the Electors should be appointed, and the Senators and Representatives elected: That the Electors should meet on the Day fixed for the Election of the President, and should transmit their Votes certified, signed, sealed and directed, as the Constitution requires, to the Secretary of the United States in Congress assembled, that the Senators and Representatives should convene at the Time and Place assigned; that the Senators should appoint a President of the Senate, for the sole Purpose of receiving, opening and counting the Votes for President; and, that after he shall be chosen, the Congress, together with the President, should, without Delay, proceed to execute this Constitution.

By the Unanimous Order of the Convention

GO WASHINGTON Presidt
W. JACKSON Secretary.

AMENDMENTS

ARTICLES in addition to, and Amendment of the Constitution of the United States of America, proposed by Congress, and ratified by the Legislatures of the several States, pursuant to the fifth Article of the original Constitution.

ARTICLE I.

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

ARTICLE II.

A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

ARTICLE III.

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

ARTICLE IV.

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

ARTICLE V.

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, not be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

ARTICLE VI.

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for ob-

taining witnesses in his favor, and to have the Assistance of Counsel for his defense.

ARTICLE VII.

In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

ARTICLE VIII.

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

ARTICLE IX.

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

ARTICLE X.

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

ARTICLE XI.

The Judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State, or by Citizens or Subjects of any Foreign State.

ARTICLE XII.

The Electors shall meet in their respective states, and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same state with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President, and of all persons voted for as Vice-President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the President of the Senate;—The President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;—The person having the greatest number of votes for President, shall be the President, if such number be a majority of the whole number of Electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by states, the representation from each state having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice-President shall act as President, as in the case of the death or other constitutional disability of the President.—The person having the greatest number of votes as Vice-President, shall be the Vice-President, if such number be a majority of the whole number of Electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice-President; a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

ARTICLE XIII.

SECTION 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

SECTION 2. Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XIV.

SECTION 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

SECTION 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, Representatives in Congress, the Executive and Judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

SECTION 3. No person shall be a Senator or Representative in Congress, or elector of President and Vice President, or hold any office civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two-thirds of each House, remove such disability.

SECTION 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

SECTION 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

ARTICLE XV.

SECTION 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

SECTION 2. The Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XVI.

The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several States, and without regard to any census or enumeration.

ARTICLE XVII.

The Senate of the United States shall be composed of two Senators from each State, elected by the people thereof, for six years; and each Senator shall have one vote. The electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislatures.

When vacancies happen in the representation of any State in the Senate, the executive authority of such State shall issue writs of election to fill such vacancies: *Provided*, That the legislature of any State may empower the executive thereof to make temporary appointments until the people fill the vacancies by election as the legislature may direct.

This amendment shall not be so construed as to affect the election or term of any Senator chosen before it becomes valid as part of the Constitution.

ARTICLE XVIII.

SECTION 1. After one year from the ratification of this article the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited.

SECTION 2. The Congress and the several States shall have concurrent power to enforce this article by appropriate legislation.

SECTION 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

ARTICLE XIX.

The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex.

Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XX.

SECTION 1. The terms of the President and Vice President shall end at noon on the 20th day of January, and the terms of Senators and Representatives at noon on the 3rd day of January, of the years in which such terms would have ended if this article had not been ratified; and the terms of their successors shall then begin.

SECTION 2. The Congress shall assemble at least once in every year, and

such meeting shall begin at noon on the 3rd day of January, unless they shall by law appoint a different day.

SECTION 3. If, at the time fixed for the beginning of the term of the President, the President elect shall have died, the Vice President elect shall become President. If a President shall not have been chosen before the time fixed for the beginning of his term, or if the President elect shall have failed to qualify, then the Vice President elect shall act as President until a President shall have qualified; and the Congress may by law provide for the case wherein neither a President elect nor a Vice President elect shall have qualified, declaring who shall then act as President, or the manner in which one who is to act shall be selected, and such person shall act accordingly until a President or Vice-President shall have qualified.

SECTION 4. The Congress may by law provide for the case of the death of any of the persons from whom the House of Representatives may choose a President whenever the right of choice shall have devolved upon them, and for the case of the death of any of the persons from whom the Senate may choose a Vice President whenever the right of choice shall have devolved upon them.

SECTION 5. Sections 1 and 2 shall take effect on the 15th day of October following the ratification of this article.

SECTION 6. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three-fourths of the several States within seven years from the date of its submission. [The text followed above is that of the "Literal Print" edition issued by the Department of State in Washington, D.C., 1933.]

ARTICLE XXI.

SECTION 1. The eighteenth article of amendment to the Constitution of the United States is hereby repealed.

SECTION 2. The transportation or importation into any State, Territory, or Possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited.

SECTION 3. This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by conventions in the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

ARTICLE XXII.

SECTION 1. No person shall be elected to the office of the President more than twice, and no person who has held the office of President, or acted as President, for more than two years of a term to which some other person was elected President shall be elected to the office of the President more than once.

SECTION 2. But this article shall not apply to any person holding the office of President when this article was proposed by the Congress, and shall not prevent any person who may be made President while the office of President, or acting as President, during the term within which this article becomes operative from holding the office of President or acting as President during the remainder of such term.

Article. V.

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose Amendments to this Constitution, or, on the Application of the Legislatures of two thirds of the several States, shall call a Convention for proposing Amendments, which, in either Case, shall be valid to all Intents and Purposes, as Part of this Constitution, when ratified by the Legislatures of three fourths of the several States, or by Conventions in three fourths thereof, as the one or the other Mode of Ratification may be proposed by the Congress; Provided that no Amendment which may be made prior to the Year One thousand eight hundred and eight shall in any Manner affect the first and fourth Clauses in the Ninth Section of the first Article; and that no State, without its Consent, shall be deprived of its equal Suffrage in the Senate.

Article. VI.

All Debts contracted and Engagements entered into, before the Adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.

The Senators and Representatives before mentioned, and the Members of the several State Legislatures, and all executive and judicial Officers, both of the United States and of the several States, shall be bound by Oath or Affirmation, to support this Constitution; but no religious Test shall ever be required as a Qualification to any Office or public Trust under the United States.

Article. VII.

The Ratification of the Conventions of nine States, shall be sufficient for the Establishment of this Constitution between the States so ratifying the Same.

The Word, "the," being interlined between the seventh and eighth Lines of the first Page. The Word "Thirty," being partly written on an Erasure in the fifteenth Line of the first Page. The Words "is and" being interlined between the thirty-second and thirty-third Lines of the first Page and the Word "the" being interlined between the forty-third and forty-fourth Lines of the second Page.

Done in Convention by the Unanimous Consent of the States present the Seventeenth Day of September in the Year of our Lord one Thousand seven hundred and Eighty seven and of the Independance of the United States of America the Twelfth. In Witness whereof We have hereunto subscribed our Names,

Attest William Jackson Secretary

Go. Washington — Presidt. and Deputy from Virginia

Delaware: Geo: Read, Gunning Bedford jun, John Dickinson, Richard Bassett, Jaco: Broom

Maryland: James M'Henry, Dan: of St Thos. Jenifer, Dan: Carroll

Virginia: John Blair, James Madison Jr.

North Carolina: Wm. Blount, Richd. Dobbs Spaight, Hu Williamson

South Carolina: J. Rutledge, Charles Cotesworth Pinckney, Charles Pinckney, Pierce Butler

Georgia: William Few, Abr Baldwin

New Hampshire: John Langdon, Nicholas Gilman

Massachusetts: Nathaniel Gorham, Rufus King

Connecticut: Wm: Saml. Johnson, Roger Sherman

New York: Alexander Hamilton

New Jersey: Wil: Livingston, David Brearley, Wm. Paterson, Jona: Dayton

Pennsylvania: B Franklin, Thomas Mifflin, Robt Morris, Geo. Clymer, Thos. FitzSimons, Jared Ingersoll, James Wilson, Gouv Morris

CONSTITUTIONS OF CLARENDON. See CLARENDON, CONSTITUTIONS OF.

CONSTRUCTION INDUSTRY. Building activity of all kinds is usually classified into the light and heavy (or engineering) construction industries. The former includes home building, building repairs, smaller commercial construction and similar activities carried out on a smaller scale; heavy or engineering construction embraces the larger kinds of building in which contracts are typically awarded, such as in the case of dams, highways, apartment buildings, bridges, sewage facilities, factories, large commercial buildings, docks, public buildings, parks, earthworks, military establishments, and similar undertakings. Because economic progress depends upon the investment of capital for future production, the rate of construction activity has a significant effect upon the economic health of a nation and upon its future strength. Many industries, such as brick manufacture, sand and gravel production, and concrete manufacture, supply their total output to the construction industry. Among others whose existence depends on the construction industry are the lumber, steel, stone, clay, marble, granite, slate, lime, pipe, asbestos, gypsum, glass, paint and varnish, building hardware, plumbing, and electrical industries. However, these industries have outlets for their products other than the construction industry.

History. Because advances in civilization depend upon the creation and maintenance of durable facilities for settled life, building activity has always formed a large part of the productive efforts of man. Many techniques, such as in carpentry, bricklaying, and plastering, were known to the ancient civilizations of Egypt and Babylon. The marble temples of the Greeks, the roads, highways, aqueducts, temples, and colosseums of the Romans, the Egyptian pyramids, the Great Wall of China, and the temples of the Mayans are all examples of construction engaged in by older societies. After the fall of the Roman Empire there was a great decline in building and in techniques in the West until about the tenth century. Thereafter the building of cathedrals, castles, churches, and monasteries was the main form of construction in medieval times. The building of cathedrals especially required complex organization, specialization of workers, development of new techniques, transportation of materials, and many workers. The largest of these required generations to complete. In England, the main building material was stone; and the chief mason, known as the "master," acted in the same capacity as the modern architect. He designed and directed the erection of the building and co-ordinated the work of craftsmen drawn from the various building trades. The transportation of materials formed a large part of the building expenses, and the shipment of suitable stone, timber and other materials was a major factor in the interregional and international trade of the period. See BUILDING STONE; CATHEDRAL.

After the Tudor period in England, private building for wealthy and noble persons replaced ecclesiastical construction as the leading form of construction activity. Increasing population, the growth of cities, and industrialization were factors that stimulated the growth of the building industry. Canals and turnpikes were built to improve transportation. The main influence in transforming and multiplying construction activity was the Industrial Revolution after 1760. The speculative builder made his appearance in private housing construction, and the contractor became the central figure in large building undertakings. See INDUSTRIAL REVOLUTION.

History in the United States. The same factors which influenced construction in England after the eighteenth century were even more powerful in the United States after 1800. New factories, urban housing, office buildings, highways, railroads, harbor works, and other facilities for industrial life required the services of the large-scale builder, the architect, the engineer, and the skilled worker. Steel, cement, brickmaking machinery, steam shovels, hoisting engines, and hydraulic and pneumatic riveters all came into wide use in the period just before and after 1900. A period of unprecedented construction in the 1920s saw a huge growth in building as many American cities assumed their modern shape and highways were built throughout the country. Such famous buildings as the Empire State, Rockefeller Center, Waldorf-Astoria hotel, Grand Central and Pennsylvania railroad stations, and many other structures were erected in this period. More than $10 billion were spent for hard-surfaced highways between 1922 and 1931. The building of Hoover Dam marked a new era in heavy construction. Private building declined during the 1930s, but public building stimulated by federal government spending resulted in the construction of many municipal, state, and federal buildings, and large dams, After 1939, federal government spending for military facilities and equipment gave a temporary stimulus to construction activity until 1943, when construction declined as the building of many new structures was postponed until the end of World War II. See DAM; ROADS AND HIGHWAYS.

Building since World War II. Low building activity in the depression years, postponed invest-

VALUE OF NEW CONSTRUCTION ACTIVITY
(In millions of dollars)

YEAR	TOTAL	PRIVATE							PUBLIC				
		Total	Residential	Business				Other nonresidential	Total	Military	Highway	Conservation	All other
				Total	Industrial	Commercial	Public utility						
1940	8,682	5,054	2,985	1,561	442	348	771	508	3,628	385	1,302	528	1,413
1941	11,957	6,206	3,510	2,082	801	409	872	614	5,751	1,620	1,066	500	2,565
1942	14,075	3,415	1,715	1,287	346	155	786	413	10,660	5,016	734	357	4,553
1943	8,301	1,979	885	759	156	33	570	335	6,322	2,550	446	285	3,041
1944	5,259	2,186	815	989	208	56	725	382	3,073	837	362	163	1,711
1945	5,633	3,235	1,100	1,672	642	203	827	463	2,398	690	398	130	1,180
1946	12,000	9,638	4,015	4,195	1,689	1,132	1,374	1,428	2,362	188	895	240	1,039
1947	16,689	13,256	6,310	4,896	1,702	856	2,338	2,050	3,433	204	1,451	394	1,384
1948	21,678	16,853	8,580	5,693	1,397	1,253	3,043	2,580	4,825	158	1,774	629	2,264
1949	22,789	16,384	8,267	5,322	972	1,027	3,323	2,795	6,405	137	2,131	793	3,344
1950	28,454	21,454	12,600	5,680	1,062	1,288	3,330	3,174	7,000	177	2,272	881	3,670
1951	31,182	21,764	10,973	7,217	2,117	1,371	3,729	3,574	9,418	887	2,518	853	5,160
1952	33,008	22,107	11,100	7,460	2,320	1,137	4,003	3,547	10,901	1,388	2,820	854	5,839
1953	35,271	23,877	11,930	8,436	2,229	1,791	4,416	3,511	11,394	1,307	3,160	830	6,097
1954	37,577	25,768	13,496	8,583	2,030	2,212	4,341	3,689	11,809	1,030	3,750	704	6,325
1955[p]	42,250	30,250	16,600	9,907	2,403	3,039	4,465	3,743	12,000	1,300	4,100	595	6,005

[p]Preliminary

SOURCE: *Joint estimates of the Departments of Commerce and Labor*

TISHMAN REALTY & CONSTRUCTION CO., INC.

Lightweight metals, enameled metals, and glass covering more extensive areas have become common in the construction of buildings. Prefabricated panels of the metals are bolted in place to form the building's façade, with a speed that markedly reduces construction costs. The skyscraper shown was enclosed in six and one-half days.

ment during World War II, new scientific and technical developments, and increasing population and high incomes combined to set off the biggest spurt in construction in United States history after World War II. From 1945, when estimated new construction was $5.7 billion, the annual total jumped to $12 billion the following year, and showed a steady upward climb each year until 1955, when the total of new construction was $42.25 billion. With many new families formed after the war and a growing population, the value of new housing starts comprised roughly one-third of the total building activity after the war. Private housing starts were 662,500 in 1946, increased each year to a high of 1.35 million in 1950, and registered more than 1 million starts from 1950 through 1955. (See HOUSING.) New developments in science and technology and deferred plant construction resulted in a high rate of plant construction, especially in atomic energy, chemicals, petrochemicals, synthetic fibers, and light metals. State and local governments launched huge highway building programs, some being financed as toll roads. Construction of commercial buildings did not match the spurt of the 1920s but the spread of population into suburban areas stimulated the building of shopping centers and supermarkets. The higher birth rate after the war also created a need for more schools, and school-building programs reached a new high level after 1950. Construction of public utility facilities, especially of petroleum and natural gas pipelines and electric power plants, also increased with growing industrial needs.

The postwar construction boom was accompanied by innovations in building materials and techniques. Glass, stainless steel, aluminum, and porcelain-enameled metal were used increasingly for building walls. Earthmoving equipment, concrete-paving machines, pipe-laying devices, and similar equipment were improved and more widely used. Prefabrication of building parts, especially in housing construction, was adopted in many cases, but it failed to achieve the larger gains predicted earlier.

Construction and the Economy. There were about 400,000 building contractors of all kinds and 4.75 million workers in the construction field in 1955. Only 5 per cent of the contractors had more than 20 employees, and the biggest firms were growing in size and scope of activities. Although some United States firms had previously engaged in construction in many other countries, during and after World War II there was a significant growth in the world-wide activities of the largest firms and those with specialized skills.

Since increased investment in capital structures is reflected in increased employment and business and wage workers' incomes, it has a so-called multiplier effect on economic activity. Thus, increased building activity is usually regarded as an indicator of higher economic activity in the future, whereas a downturn in construction is regarded as a sign of approaching lower economic activity. Yet building expenditures after World War II, although contributing to a prolonged period of prosperity, were a smaller proportion of the national product than in the 1920s boom. Construction spending in the period 1951–53 averaged 9½ per cent of the national output as compared with 15½ per cent in the years 1927–29, when building was more speculative in purpose. See ARCHITECTURE; BRICKLAYING; CARPENTRY; MASONRY.

S. N.

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CONSUBSTANTIATION, the doctrine that in the Eucharist or Lord's Supper the body and blood of Christ are present in, and of the same substance with, the bread and wine. This doctrine arose after the Reformation leaders rejected transubstantiation, the doctrine of the Roman Catholic and Eastern Orthodox Churches. In transubstantiation it is held that the bread and wine, when consecrated by the priest, are substantially changed into the body and blood of Christ. Martin Luther held that the bread and wine are real bread and real wine and are also "the real flesh and real blood of Christ." His doctrine is generally, but inaccurately, called consubstantiation. The theory of consubstantiation is that after

consecration the bread and wine continue to exist in their original form but are *substantially* conjoined with the body and blood of Christ. Luther's doctrine was that the bread and wine are *sacramentally* conjoined with the body and blood of Christ. Luther differed from Huldreich Zwingli and John Calvin in asserting the *corporeal* presence of Christ, rather than his *spiritual* presence, in the Lord's Supper. See EUCHARIST; TRANSUBSTANTIATION.

CONSUL, chief civil and military magistrate of ancient Rome, of which there were two. The original title was probably "praetor," and it was only when a third praetor was added that the senior pair came to be known as consuls. The consulship was instituted in 509 B.C. following the expulsion of the kings. Originally patricians alone were eligible for the office, but after a struggle of more than a century the Licinian Law of 367 B.C. provided that at least one of the consuls should be a plebeian. Meanwhile the authority of the consul had been further limited by the creation of the censorship, 443 B.C. In 366 B.C. the praetorship was instituted as the supreme judicial authority, and was confined to patricians—a maneuver by which that order attempted to make up for the partial surrender of the consulate to the plebs. See CENSOR; PRAETOR.

The consuls summoned and presided over the senate and the assembly, raised and commanded troops, imposed fines and even capital sentences, spent the public money without supervision, undertook public works of all sorts, and were not responsible to others, except that they might be prosecuted as private persons. There was no constitutional method of deposing a consul; and if he refused to lay down office it was held that his acts were legal and valid, even after his term of one year was concluded. In practice, however, the consuls usually executed the will of the senate. The symbol of their authority was the bundle of rods (*fasces*), with the axe in the center, which was carried before them by 12 lictors. Dates were frequently given by naming the consuls of the year.

In the later years of the republic (after 133 B.C.) the office was shorn of most of its importance, although it was still highly prized. The consuls kept the adminstration of the domestic affairs of Rome while the government of the provinces, military matters, and foreign affairs generally was conducted by *proconsuls*, usually men who had previously held the consulship. The consulate finally became a municipal magistracy or a sort of lord mayoralty, an office of no real power. It existed down to the latest days of the empire, with its tenure limited to six months, and later even to two months. Although a form of election existed in the early empire, the consuls were really nominated by the emperor. The last consul was appointed at Rome in 536, and at Constantinople in 541. See ROME, *Early History.*

The title of consul was revived in France in 1799, and Napoleon I governed as first consul until his coronation as emperor in 1804.

CONSULAR SERVICE, the system of offices which a state maintains in various foreign countries for the purpose of guarding the interests (chiefly commercial) and welfare of its nationals abroad. The receiving state authorizes the consul to perform these functions within a particular locality by granting him a written permit called an exequatur. For the United States, these functions are performed by consuls of various ranks belonging to the Foreign Service.

The origin of the consul is found in ancient Greece and consular representation is the original and most fundamental form of official international intercourse. From the beginning of extensive international commerce a need existed for protection for groups of merchants residing abroad. The cities of Greece appointed a *proxenus*, or patron, to represent merchants from a particular city and this permanent official became much more important than the transient diplomatic agents of the period.

U.S. DEPT. OF STATE

A U.S. vice-consul is shown administering an oath to a prospective bridegroom in connection with the latter's affidavit asserting there is no impediment to his marriage.

Development. When Mediterranean commerce began to revive from its long period of stagnation during the Crusades, the consular office reappeared. The cities of Genoa, Valencia, and Amalfi began in the twelfth century to send such agents to the Levantine ports. Consuls were elected or sent out from the home state to serve the new merchant communities. The accepted doctrine at this period was that an alien was subject only to the law of his home state and not to the foreign state where he was carrying on his business. Thus the consuls acted as magistrates in settling questions of maritime and commercial law and dealt with local authorities in matters concerning the protection of their nationals' ships and property. The newly developed European national states of the fifteenth and sixteenth centuries, realizing the value of these services, sent "consuls of *outremer*" who replaced their semiofficial predecessors.

As the members of the western state system became more and more nationalistic, aliens lost the right to appeal to their own laws except in some predominantly non-Christian nations. In Turkey and China, among others, treaties were signed establishing a system of extraterritoriality; however, such arrangements were practically dicontinued by the time of World War II. See EXTRATERRITORIALITY.

Most national consular systems are based on the French system established before the French Revolution and reorganized in 1836 and later, when the consular service was joined closely to the diplomatic service.

Consuls and Diplomats. A clear distinction is made in law and practice between consuls and diplomats. Consuls may deal only with local authorities while diplomats are accredited with the national governments. Consuls have diplomatic privileges and immunities only when they are in the act of performing their official duties; their records may not be disturbed by foreign officials. Diplomats are primarily responsible for political functions.

With the development of civil stability in most nations the judicial function of consuls diminished as commercial duties grew in importance. Consuls report on trade opportunities which may be of interest to businessmen in their respective countries. They answer trade inquiries and make regular trade reports which are usually published and made available to businessmen. Every large city in the world has a number of foreign consuls in residence.

Although consular duties pertain primarily to commerce, consuls are pledged to act as protectors and advisers of their countrymen in foreign lands, to prevent frauds on revenue, to notice infractions of treaty stipulations relating to trade, to advise their governments of new laws or regulations within their districts, to aid destitute nationals, and to make reports upon matters affecting commercial, industrial, financial, and agricultural pursuits.

United States Consular Service. In addition, United States consuls perform certain judicial functions. They act as probate judge and public administrators of the estates of deceased Americans who leave property within their jurisdiction, and record deeds, bonds, wills, and other legal documents. They further exercise police jurisdiction over offenses committed on American vessels on the high seas. They visa passports, verify invoices of goods shipped to the United States, and inspect manifest of vessels bound for that country.

Agents with consular powers were appointed during the Revolution, and President Washington appointed a number of consuls whose status was legally based on an act of 1792. The consular service of the United States developed irregularly until it was reorganized by an act of 1856 defining the power and duties of officers, classifying offices, and regulating salaries and fees. Consular posts were political plums, and the service could not develop professionally because of the changing political fortunes of the parties. Executive orders in 1895 and 1906 provided for competitive examinations and appointments and promotions generally on a career basis. The Foreign Service of the United States was created by the Rogers Act (1924), which provided for the merging of the diplomatic and consular services. This act also established a rigid system of examinations and a career service whereby those passing the examinations could be promoted ultimately to the rank of minister. See Diplomatic Service.

CONSUMER, one who utilizes material goods or services for the satisfaction of his desires. In the premodern stages of commercial economy, when most manufacture was carried on by small local units and the domestic arts still supplied a large proportion of consumer goods, the consumer's opportunity for effectively satisfying his demands depended on the shrewdness of the individual purchaser. Operating in a relatively simple economy, in a face-to-face relation with the seller, the consumer was in a position to analyze the quality of consumption goods and select those most serviceable for his needs. With the change-over from home to factory production and from a simple economy to a complex market system, the consumer was forced to contend with new problems of buying and living. Modern technology, in widening the consumer's range of choice, increased the difficulties of judging the quality of goods, a skill reserved largely for experts and professional buyers. Modern business methods have also increased the hazards for the consumer, primarily through the introduction of large-scale advertising techniques tending to persuade consumers to buy articles which are not necessarily superior to others in the same field.

These conditions have stimulated a number of popular efforts, known collectively as the "consumer movement," aimed at reinforcing the weakened status of the consumer. Originating in the late nineteenth century, the trend to protect the individual buyer has been spearheaded at various stages by individuals, organizations, professional and lay groups, and several government agencies. The broad goals of the consumer movement have been to secure factual information about goods and services offered for sale, to promote honesty in advertising, to require labels indicating the grade of meat and canned goods, and to promote legislation to insure the purity and safety of foods, drugs, and cosmetics. The consumer movement has also advocated lower distribution costs, consumer representation in government, and effective education for consumers. Although the growth of the movement has been neither rapid nor steady, it has been responsible for an increasing awareness of the need for consumer competency to be as great as producer efficiency. The most vigorous growth of the movement occurred during the depression of the 1930s, when the expansion was so rapid that the era sometimes is credited mistakenly for the birth of the consumer movement.

FOOD AND DRUG ADMINISTRATION

An inspector examines figs for insect infestation. Food and drugs are also checked for ingredients dangerous to health, for adulterations, and also for deceptive labeling.

Several popular exposés gave impetus to the movement in the twentieth century. Forerunner of these was *The Jungle* (1906) by Upton Sinclair, written to draw attention to conditions in the meat-packing industry. Other publications that succeeded in arousing consumer ire were *Your Money's Worth* (1927), *100,000,000 Guinea Pigs* (1933), *Skin Deep* (1934), and *American Chamber of Horrors* (1936).

Among the many voluntary organizations active in behalf of the consumer, the earliest, according to record, was the National Consumers League, started in 1899. Notable for their work since then have been the American Home Economics Association, American Association of University Women, General Federation of Women's Clubs, National League of Women Voters, League of Women Shoppers, and National Federation of Business and Professional Women's Clubs. There have been a few brief attempts to have consumer representation in federal government agencies. The first of these was the establishment in 1933 of the Consumers' Advisory Board under the National Recovery Administration, giving consumers equal representation with labor and industry in establishing NRA codes. The most effective and longest-lived government group was the Consumers' Counsel of the Agricultural Adjustment Administration, also created in 1933, whose job was to represent the consumer in marketing agreements. The counsel published a magazine, *Consumers Guide*, that did much to focus attention on consumer problems. In addition to these groups there were the Consumers' Counsel of the National Bituminous Coal Commission, established in 1935, and the Consumer Division of the Office of Price Administration, in operation from 1941 to 1946. Although no provisions were made for direct representation of consumers in the federal government, several government agencies established programs to serve consumers in one capacity or another. At least one state, New York, made arrangements for official recognition to consumers through a Consumer

CONSUMERS' RESEARCH, INC.

Automotive experts of a consumer testing organization keep a close watch on instruments in checking gasoline consumption and measuring acceleration at various speeds.

Counsel to the governor. Consumer education was systematically undertaken with the establishment of the Institute for Consumer Education in 1937, whose purpose was to increase economic knowledge. Although disbanded in 1941, it pointed to a need that has since received much attention.

Results of the consumer movement are to be seen in the growth of consumer co-operatives; in the establishment and acceptance of two consumer testing and rating organizations, Consumers' Research, publisher of *Consumer Research Bulletin*, and Consumers' Union, publisher of *Consumer Reports;* in improved pure food and drug laws, and in the increased emphasis on consumer education in the schools. See BARTER; BUDGET, FAMILY; HOME ECONOMICS. RAY G. PRICE

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CONSUMER CO-OPERATIVE. See CO-OPERATIVE.

CONSUMER CREDIT is personal borrowing against future income to pay for current purchases of goods and services. Although it is not always possible to distinguish between loans made for consumption and those made for productive purposes, the specialization of credit agencies permits a rough demarcation. The two basic kinds of consumer credit are cash loans and sales credit as in the case of installment selling. (See INSTALLMENT SELLING.) In selling to the mass of consumers, the most notable example of credit extension is that for automobiles and home appliances, both of which depend upon time payments for a large part of their total sales volume. Some economists believe that sustained prosperity in the United States economy depends to a large extent upon a high rate of buying on time. In most discussions of consumer credit and in statistical research, only short- and medium-term credit is considered, but long-term credit, as in the case of home mortgages, must also be regarded as a part of consumption loans. Thus, the term of a consumer loan may range from less than a month, as in the case of a physician's fee or a department store charge account, to 30 years for a home mortgage. Personal loans also include small loans made by pledging personal articles and other property at a pawn shop or a small loan company.

Cash Credit Agencies. The agencies granting cash credit to the consumer include: (1) philanthropic agencies; (2) semi-philanthropic agencies, such as the various student loan funds established by colleges and church groups; (3) co-operative or mutual cash credit agencies, including credit unions, mutual benefit associations, savings and loan associations, and employer-employee funds; and (4) commercial cash credit agencies, including consumer finance companies, commercial banks, industrial banks, Morris Plan companies, savings banks, insurance companies, pawnbrokers, and savings, loan and investment companies. See BANKS AND BANKING; CREDIT UNION; SAVINGS AND LOAN ASSOCIATIONS; SAVINGS BANKS.

Commercial agencies carry on the largest portion of the cash credit business, but co-operative agencies have grown rapidly in recent years. The co-operative agencies are those set up to serve a group of individuals with some mutual interest. Many of them, especially the credit unions, receive deposits from members as well as serve as lending agencies. The commercial agencies operate for profit, usually under the small loan laws which in many states permit interest rates above the maximum under usury laws. Personal loan departments of commercial banks and consumer finance companies are frequently used. Consumer finance companies usually operate on a straight interest rate basis, with most loans secured by chattel mortgages. The most dangerous lending agency is the unlicensed lender, who still flourishes in states having inadequate small loan laws. By such devices as "purchasing" part of the borrower's future wages at a low price, the loan shark is often able to avoid many of the usury laws. See INTEREST; PAWNBROKER.

History. Although consumer credit is often assumed to be a modern invention, it has an extremely long history. Because of the necessity of many primitive people to make barters or borrow in order to live from day to day, the personal loan for consumption purposes is found among them. Throughout human history, it has been an important institution for daily living. Owing to the shortage of legal currency and banking institutions in colonial America, the use of credit in retail trade was at least as common as in modern times. Credit rather than cash was the common rule. Wholesale and retail merchants received long-term credit from English exporters so that merchants were able to provide longer credit terms than are normal today. The ratio of bad debts was also high. This situation prevailed, especially in the West, until the Civil War. After 1865 the larger number of banks and a more adequate supply of money decreased the reliance on credit for daily necessities, but in the selling of more durable consumer items, such as musical instruments, sewing machines, encyclopedias, and furniture, use of time sales became a common practice. There were many abuses of this method of selling, especially among low-income immigrant groups, but its place in promoting consumer buying was established. In retail trade, the credit period for charge accounts was shortened, and some dry goods stores began the then novel practice of selling for cash only.

Among cash credit agencies, the pawnbroker is of ancient lineage and was early on the American scene. However, the small loan business, specializing in small loans at high rates to wage earners, is believed to have begun in Chicago around 1870. Abuses in this business brought it into low repute. Studies by the Russell Sage Foundation in 1907–08 led to corrective legislation in many states, and regu-

lation resulted in better practices. The first credit union in the United States was formed in 1910 in Manchester, N.H. Intermediary finance companies, which provide capital for installment selling, also began shortly after 1900. A pioneer finance company for automobile selling was started in Seattle in 1910.

After the short depression of 1920–22, installment selling became a major factor in selling durable consumer goods, especially automobiles. The business of automobile finance companies quadrupled between 1923 and 1929, contributing to the rapid growth of the automobile industry. Installment selling declined during the depression years of 1929–33, but again mounted after 1936. As defense preparations required a growing proportion of production, the Federal Reserve Board undertook to control the extension of consumer credit under Regulation W in 1941.

Federal Regulation. Since 1941 the federal government, especially the Federal Reserve Board, has taken an increasing interest in controlling the amount of consumer credit extended, mainly because of its effect in increasing prices by placing more money in the hands of the consumer. This was especially true during World War II and the Korean War when consumer credit regulation was enforced by the Federal Reserve Board. These restrictions were not intended to protect the consumer but were undertaken to control the amount of consumer spending.

Regulation W was complicated and frequently changed. During World War II it required that all charge accounts should be paid within 60 days, installment credit should not run for more than one year, the purchaser was required to make a down payment of one-third the purchase price, and roughly equal payments were required to be made at regular intervals. This regulation was continued in modified form after World War II until November 1947. It was reinstituted in 1950 during the Korean War in somewhat milder form than during World War II.

After a mild recession in 1954, a sharp increase in consumer credit extensions in 1955 was believed to have been a leading factor in causing an unprecedented level of prosperity. Installment credit, especially for automobiles and home appliances, rose sharply. This touched off further discussion of the advisability of instituting federal control over the extension of consumer credit. See CREDIT; DEPARTMENT STORE; RETAIL TRADE; SAVING. S. N.

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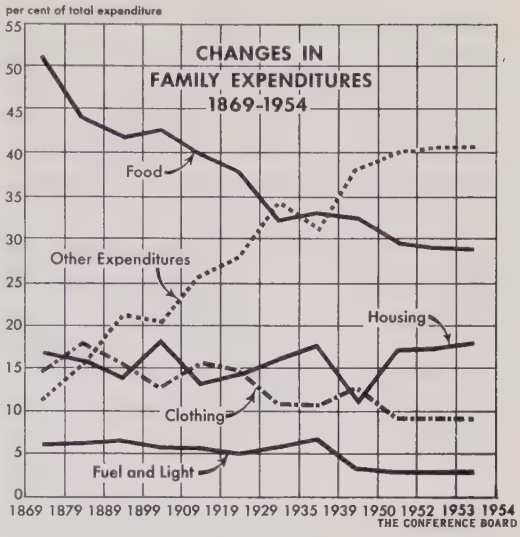
CONSUMER GOODS. See CONSUMPTION.

CONSUMPTION is the utilization of goods and services for the direct satisfaction of human wants. Some goods and services, such as food and fuel, are destroyed in the act of utilization; other goods are durable and render services for a long period of time. If provision is made for maintenance and replacement, durable consumer goods may render services indefinitely.

The importance of consumption in social economic thought is of relatively recent origin. Before the eighteenth century the obligations of people to either church or state were regarded as primary and the material welfare of the individual was secondary. When Adam Smith published his *Wealth of Nations* in 1776, his emphasis on individual welfare was a radical departure from most previous writers. Nevertheless he and his successors in the classical school



of economics, including Ricardo, Malthus, and Senior, mainly regarded the goods and services rendered for consumption as being necessities required for the subsistence of the working population. A distinction was made between productive and unproductive consumption. Cost of production in terms of human labor became the ultimate determinant of value and price. This was the labor theory of value. Production was stressed as opposed to consumption—which was generally believed to be for the replenishment of the working population. Malthus raised grave fears that the growth of population would outstrip food production. See ECONOMICS; PRODUCTION, COST OF; PRICE; VALUE.

Consumption assumed its importance in economic thought with the elaboration of the theory of subjective value in the early 1870s. Although this theory was discovered almost simultaneously by Walras in France and Jevons in England, its rapid adoption is usually attributed to the Austrian school of economics under the leadership of Menger, Wieser, and Böhm-Bawerk. This concept, still accepted in modified form, explained value as depending upon the rational choices of consumers in satisfying their wants. See MARGINAL UTILITY.

After the initial phase of the Industrial Revolution the rise in living standards and changes in consumption were factors in reinforcing the economists' new emphasis on consumption. Painstaking research on the cost of living had begun in the eighteenth century. A significant early work in the theory of consumption was that of Ernst Engel, 1857, which showed that with increasing income a decreasing proportion of income was spent for food and a larger share for "higher" goods. Considerable theoretical work and statistical research have since been devoted to consumption and consumer demand for various goods and services. During and after World War II the U.S. government conducted studies on family budgets to determine patterns of expenditure for various consumer items. A major influence was Keynes' concept of "propensity to consume" which relates aggregate consumer spending with income. However, theories in the field of consumption are still regarded as having serious deficiencies.

The distinction between consumption and productive investment is not entirely clear. The services that are rendered in feeding, clothing, sheltering, and educating the individual may from one standpoint be regarded as consumption, but from another view they may also be regarded as investments in human capacities (capital) for which there is a productive return. Furthermore, the productive re-

turn is roughly proportional to the training and education a person receives. Such services are chiefly regarded as consumption because legally there can be no long-term investment in human beings since they cannot be forced to perform future services in return. Under slavery, the consumption services thus rendered were usually regarded as investment in capital.

Research in consumption usually takes two forms: family budget studies which show how consumer goods and services are chosen by individual families at various incomes and sets of prices, and time series studies that relate over-all consumption of goods and services to changes in such things as over-all income levels and general price levels. Yet, because there are many social and psychological factors involved in consumer buying, such as the influence of advertising, social pressures ("keeping up with the Joneses"), fads and fashions, and lack of knowledge concerning products, the analysis of consumer behavior is filled with difficulties. Survey methods have been developed since World War II which have helped to reveal in general terms the buying plans of consumers. Because of its great influence on economic conditions and the profitability of individual businesses, basic economic research in consumption and market research on consumer behavior have grown rapidly. See Cost of Living; Market Research; Standard of Living; Supply and Demand. S. N.

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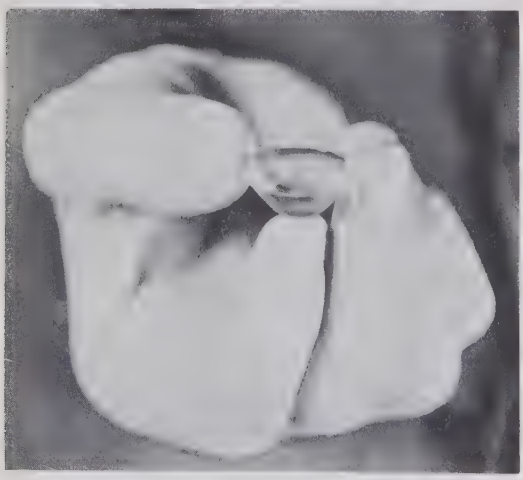
CONSUMPTION. See Tuberculosis.

CONTACT LENS, a glass or plastic device worn in the eye to improve sight or protect vital areas from injury (see Eye). The lens is placed in front of the cornea and is separated from it by a fluid similar to tears or by tears themselves. The lens is held in place either by the curvature of the cornea and the surface tension of the fluid or by a flange of the lens that extends over the sclera, the white portion of the eye.

In 1801 Thomas Young proposed the use of a glass lens directly in contact with the cornea. After Young's proposal, investigation in the field continued until about 1911 when the Carl Zeiss Company, a leading German manufacturer of optical instruments, produced a systematized series of lenses that fitted crudely over the eye. In 1933 Dr. Joseph Dallos of Budapest, Hungary, made the first negative casts of the living eye, thus establishing the procedure for making a fitted lens. Dallos also solved the technical problem inherent in adding high corrective power to the central area of the contact lens.



OBRIG LABORATORIES, INC.

Contact lenses usually are an excellent replacement for eyeglasses, for they increase the visual field's effective scope, are virtually unbreakable, and hard to dislodge.

In 1939 John Mullen of Boston, Mass., developed the first plastic contact lens, and other plastic lenses followed soon afterward. Although the plastic lens scratched more easily than glass, it was lighter than glass, almost unbreakable, and was more flexible. For some time in order to place the contact lens in the eye a fluid had to be used between the lens and the cornea. The fluid was considered an extension of the cornea and the optical system. Newer models of contact lenses, however, are put in place dry and are constructed so as to cause a small amount of tears to flow. These lenses, called corneal lenses, fit only over the cornea and do not extend over the sclera.

Contact lenses are worn for therapeutic, protective, and cosmetic purposes. Persons wearing contact lenses for therapeutic and protective purposes include those who cannot see adequately even with spectacles and those whose cornea has been damaged in some way. Many people for business or social reasons prefer the contact lens to regular spectacles. On the average, contact lenses are kept in place from three to six hours, but many wearers have found the lenses comfortable for much longer periods. The possiblility of injuring the eye by breaking a lens of glass is not appreciably greater for one who wears contact lenses than it would be if he wore rimless spectacles with thin glass lenses.

CONTACT PROCESS. See Sulfuric Acid, *Contact Process.*

CONTAGION and **CONTAGIOUS DISEASE.** See Communicable Disease.

CONTARINI, Venetian family whose members included eight doges and many military leaders, merchants, and scholars. Domenico was, in 1043–71, the first doge, and is notable for having begun the rebuilding of St. Mark's Cathedral. Andrea, doge from 1367 to 1382, was the first to melt down his gold and silver plate to prosecute a war (with Genoa, 1380). Other famous Contarini were: Gasparo, 1483–1542, cardinal and diplomat who sought to effect a reconciliation between Catholics and Protestants at the Diet of Ratisbon, 1541; Simone, 1563–1633, a diplomat; Moneico II, doge in 1659–74, ceded Candia to Turkey; Carlo, under whose rule, 1655–56, the Venetians won a naval victory at the Dardanelles; and Marco, 1631–89, music patron and collector of musical manuscripts later acquired by the Marciana library in Venice.

CONTEMPORANEITY or **CONTEMPORANEOUS,** a simultaneous occurrence of two or more geological events. Contemporaneous usually signifies veins and patches of depositions that occurred during the formation of the enclosing rocks. If silica is precipitated on limestone and then buried, the resulting chert is contemporaneous with the enclosing rock, limestone. Thomas Huxley pointed out that two formations that are strictly contemporaneous may contain very different fossils. He proposed to call such groups of strata homotaxial (see Homotaxis).

CONTEMPT OF COURT is any mode of conduct that implies disrespect toward the judiciary or shows a deliberate intention to lower it in the public estimation, or to set at naught or to abuse its power and authority. Thus, insulting words spoken to a judge in his official capacity, or disorderly conduct in his presence, statements or writings which reflect on his capacity or integrity, disobedience by a witness to a subpoena, or refusal to answer legitimate questions, neglect by a party to comply with a judicial order or judgment, abuse of process or frauds practiced on a court, are all instances of contempt. Superior courts

generally have the right to punish summarily every such offense by fine or imprisonment, but the power of inferior tribunals in this direction is usually confined to those contempts that interrupt the actual course of their proceedings—uproarious behavior in court or neglect of a summons, but not slanderous statements uttered or published outside. Contempt of court may be a ground for a prosecution or indictment.

Fair criticism of the manner in which a court conducts its proceedings is not regarded as a contempt—at any rate if the aim of such criticism is the public utility, and not the attainment of private ends. Courts of equity regularly enforce their decrees for performance or nonperformance of specific acts by punishing disobedience thereto as contempt. This is the origin of the popular phrase "government by injunction."

CONTEST, a competition for prizes awarded in goods, services, or cash, usually in the promotion of consumer products, such as appliances, food preparations, soaps and detergents, or newspapers. These competitions take various forms, but are almost entirely conducted by public announcements through newspapers, magazines, radio, and television and are entered by mail. Total prizes may amount to tens of thousands of dollars in value and may include cash, automobiles, homes, household furnishings, vacation trips, and many lesser goods and services. In the merchandising of household items that require mass sales but are fairly similar in quality and appearance to competing products, the contest method is a popular means of sales promotion.

A common type is the essay contest in which the entrants submit a short slogan or appreciation of a product. Specialized firms handle the details of the contest and judge the merits of the entries submitted. The entries usually but not necessarily are accompanied by evidence of purchase of the product such as a box top or coupon. Another form of contest is based on some skill or proficiency, such as cookery, wherein a recipe or the prepared food itself may be the entry to be judged. See MARKETING.

CONTI, NICCOLÒ DE', fifteenth century Venetian traveler and writer. Born of a noble family, Conti was a pioneer in establishing European trade with the East. Leaving Venice ?1419, he traveled for about 25 years, his itinerary including Damascus, the Arabian Desert, Mesopotamia, Baghdad, the Persian Gulf, and Cambay. He later traveled in Sumatra, Java, Indochina, and Burma; then, by the way of Socotra, Aden, Mecca, and Egypt, he returned to Venice in 1444. As penance for having renounced his faith (because overland routes had been closed to Christians), Conti was ordered by Pope Eugenius IV to tell his story to Poggio Bracciolini, papal secretary. The account was published in 1723 as *Historiae de Varietate Fortunae.*

CONTI, HOUSE OF, collateral branch of the French royal house of Bourbon. Armand de Bourbon, prince de Conti, 1629–66, son of Henry II and brother of the Great Condé, was the founder of the family. He was the leader of rebel armies of the Fronde hostile to Cardinal Mazarin, but their differences were eventually reconciled. Conti married the cardinal's niece, commanded the French army in the wars with Spain and Italy, 1654–57, and was a friend of the playwright Molière. Conti's son, Louis Armand, 1661–85, married Marie Ann, a daughter of Louis XIV; he fought in Flanders and with the Hungarian Imperialists against the Turks, 1683. Another son, François Louis, 1664–1709, also aided the Imperialists; he fought brilliantly in Flanders, and in 1680 married Marie Thérèse de Bourbon, granddaughter of the Great Condé. He was elected king of Poland, 1697, but upon arriving at Danzig found that Augustus II, Elector of Saxony, had taken the throne. Louis François de Bourbon, 1717–76, grandson of François Louis de Bourbon, led the French army to victory at Coni, 1744, served in Germany, 1745, and in the Netherlands, 1746–47. Through the machinations of Madame de Pompadour, he lost the favor of Louis XV and soon came to be an opponent of the king. His son, Louis François Joseph, 1734–1814, last of the line, fought in the Seven Years' War, 1756–63, and died in exile.

CONTIGUITY, LAW OF. See ASSOCIATION, LAWS OF.

CONTINENT, a large land mass on the surface of the earth. Conventionally the land area of the world is divided among seven continents—Asia, Africa, North America, South America, Antarctica, Europe, and Australia, ranked in order of decreasing size. The Old World is the largest single land mass and is made up of four continents, Europe, Asia, Africa, and Australia. Europe and Asia, sometimes called Eurasia, are separated by an arbitrary-boundary taken through the Caucasus Mountains, along the Ural River and the Ural Mountains. The Isthmus of Suez is taken as the division between Asia and Africa. The New World comprises two continents, North and South America, which are separated by the Isthmus of Panama. The seven continents cover about 29 per cent of the earth's surface.

The land masses of the earth above the oceans have a comparatively level surface on which depressions and mountains form relatively insignificant surface irregularities. The outer portion of the land masses is submerged beneath the surrounding oceans to form the Continental Shelf. Thus the continents extend beneath the oceans and have larger areas than maps of dry land indicate. The outermost margin of the land masses is the Continental Slope which descends abruptly to the ocean basins. The continental land masses have been, and continue to be, subject to great changes. Elevation and subsidence have occurred repeatedly in the history of the continents and every part of the earth's land has at one time been beneath the sea. The forces of erosion are constantly working to wear down the land surfaces so that the continents would eventually be destroyed, were it not for periodic uplifts. See AFRICA; ANTARCTICA; ASIA; AUSTRALIA; CONTINENTAL SHELF; EUROPE; GEODESY; NORTH AMERICA; SOUTH AMERICA.

CONTINENTAL CONGRESS, the body through which the 13 colonies in America acted in matters of common concern before and during the American Revolution. The name is also often applied to the body, more properly designated the Confederation Congress, which met under the Articles of Confederation (1781–89). See ARTICLES OF CONFEDERATION.

The First Continental Congress met in Philadelphia Sept. 5, 1774, and was composed of delegates chosen by irregularly convened assemblies and conventions. All the colonies except Georgia were represented. Although without legal status, the Congress claimed to voice the sentiments of the united colonies, issued a declaration of rights and grievances, prepared various addresses, and carried a resolution, known as "the Association," that no more goods—particularly no slaves or tea—should be imported from England and the other English colonies.

The Second Continental Congress, which was convened May 10, 1775, and continued, with occasional adjournments, until March 1, 1781, was composed of delegates appointed by the colonies or, later, states, in varying numbers, in various ways, and for varying periods of service. At first acting as a center for common consultation and protest, the Congress soon assumed important administrative functions. It took necessary measures for the creation and administration of the Continental Army and for the carrying on of the war; it appointed George Washington commander in chief; it appointed a Committee of Secret Correspondence Nov. 29, 1775, to which it entrusted the foreign relations of the colonies; it adopted on July 4, 1776, the Declaration of Independence and ratified the treaty of alliance with France in 1778. The Congress did not levy taxes, although it made requisitions on the various states; it left to the states

The Second Continental Congress appointed George Washington head of the colonial armies, June 15, 1775.

the manner of election and terms of service of members of the Congress; by correspondence and otherwise it greatly influenced the acts of the provincial and state governments. The vote in the Congress was uniformly cast by colonies or states, each having a single vote.

The dates and places of actual meetings of the Continental Congress were: Sept. 5—Oct. 26, 1774, Philadelphia; May 10, 1775—Dec. 12, 1776, Philadelphia; Dec. 20, 1776—March 4, 1777, Philadelphia; Sept. 27, 1777, Lancaster, Pa.; Sept. 30, 1777—June 27, 1778, York, Pa.; July 2, 1778—1781, Philadelphia. The meeting place of the Continental Congress would regularly have been Philadelphia but for fear of the British army. Congress under the Articles of Confederation met at Philadelphia, Princeton, N.J., Annapolis, Md., Trenton, N.J., and New York. The presidents of the Congress until the adoption of the articles were: Peyton Randolph of Virginia, in 1774 and again in 1775; Henry Middleton of South Carolina, 1774; John Hancock of Massachusetts, 1775–77; Henry Laurens of South Carolina, 1777–78; John Jay of New York, 1778–79; Samuel Huntington of Connecticut, 1779–81; and Thomas McKean of Delaware, 1781.

Theoretically a collection of delegates representing states which claimed full sovereignty after the Declaration of Independence, the Congress acted in many ways as a national government, exercising executive and administrative as well as legislative functions. It was the political center of the revolutionary effort, and the practices and institutions developed by the Congress provided valuable experience and precedents to the later writers of the Constitution and those who governed under it. See also UNITED STATES HISTORY; REVOLUTION, AMERICAN.

CONTINENTAL DIVIDE, the upland ridge of a continent that separates drainage systems emptying into different oceans. The continental divide is not necessarily the highest mountain ridge of a continent but merely the one that demarcates the major drainage systems. In North America the continental divide extends through the Rocky Mountains, separating the waters destined for the Pacific and Atlantic oceans.

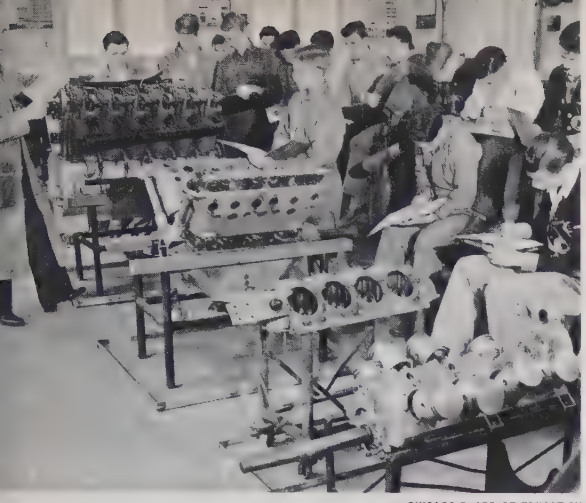
CONTINENTAL DRIFT. See GEODESY.

CONTINENTAL SHELF, the outer portion of a continent submerged beneath shallow sea. The continental shelf has a fairly level, gently sloping surface which reaches a depth of about 100 fathoms (600 ft.) at its outer edge. The shelf is covered with sediments brought down by rivers and distributed by currents in the sea or ocean. Portions of continents may be more or less lacking a continental shelf, and in other places the shelf may extend several hundred miles from land. At the outer edge the continental shelf descends steeply to the ocean basin floor in the continental slope. An unusual feature of continental slopes is the fact that in many places they are deeply cut by submarine canyons. The cause of the canyons is unknown, but may be the result of erosion by currents on the sea floor.

CONTINENTAL SYSTEM, the effort of Napoleon I to defeat Great Britain by economic pressure. After the battles of Austerlitz, 1805, and Jena, 1806, Napoleon held control of the Continent, but after Trafalgar, October 1805, British control of the seas was equally sure. By the Berlin Decree of Nov. 21, 1806, the British Isles were declared in a state of blockade, and all trade with them from the continent of Europe was prohibited, as was trade in British goods. The decree was intended to diminish British exports and, so far as possible, imports and to substitute French for British goods. (See BERLIN DECREE.) The British government responded in 1807 with the Orders in Council, virtually declaring Europe in a state of blockade. Most of Europe, under Napoleon's power, was forced to join in his system. Though the orders of neither side were thoroughly enforced, they caused loss and hardships to neutrals, of whom the United States was most important. By the Milan Decree of December 1807, neutral vessels that stopped at British ports or obeyed the British orders were made subject to capture (see MILAN DECREE). The system was one source of hostility to Napoleon among neutrals and the peoples under French control.

CONTINGENT, a legal right, interest, or obligation which has no present existence and which may never exist or become vested except upon the occurrence of some future event which is not certain to happen. Thus, a *contingent estate* is one which may be limited to a person not *in esse*, or not yet born. *Contingent fees* are those payable only out of the proceeds of a successful lawsuit. A *contingent liability* is one which may never arise, unless something happens or does not happen. For example, if the repayment of a loan is guaranteed, the guarantor may become liable, but only in the event the loan is not repaid. See EXECUTORY.

CONTINUATION SCHOOL, a public school or series of classes for employed youth, who are required to attend on a part-time basis to continue or complete their education. The continuation school developed out of the compulsory education movement in Europe and the United States during the 1800s, to provide additional education for the many children who had left school to work in industry or trade. In 1869 Germany passed the first laws calling for the establishment of continuation schools, authorizing the 26 German states to set up their own systems for educating young workers. Most of the states set up systems requiring daytime school attendance of at least eight hours a week for four years up to the age of 18. Czechoslovakia, Austria, Switzerland, and France



CHICAGO BOARD OF EDUCATION

Continuation School Class in Aircraft Engine Mechanics

adopted the German pattern. British laws differed in permitting children to attend school at night.

In the United States, Wisconsin established compulsory continuation education in 1909. Several states followed Wisconsin's lead and the number of continuation schools grew substantially after the passage of the Smith-Hughes Act in 1917, which provided federal aid to state programs of vocational education. This aid increased the emphasis on vocational training, which grew as apprentice training decreased. Continuation schools, usually limited to industrial areas, varied in nature and requirements in each state. Compulsory attendance ages ranged from 12 to 18 years, with most states requiring at least four hours of schooling each week.

During the 1930s the passage of acts raising the minimum age for employment in most industries to the maximum age for compulsory education brought a decline in the continuation school program. A number of school systems, especially in larger cities, revamped their continuation programs after 1950 to de-emphasize apprentice training and to emphasize orientation to the business and industrial world. The programs were designed to provide placement counseling, as well as to continue the basic education of young people who dropped out of school before graduation. See Apprentice; Evening Schools; Vocational Education.

CONTOUR, a line on a map drawn through all points of equal elevation in relation to sea level. Contours are a common and accurate means of depicting relief, or the surface irregularities of the land. The distance between the lines, or interval, is chosen with reference to relief. Areas of marked relief will generally be shown by closely spaced contours. Where the slope is gentle, lines are generally spaced farther apart. The pattern of contour lines on a map not only gives a vivid visual impression of the form of the land but also conveys accurate information about slopes and heights. The contour interval unit of measure, or vertical spacing of the contours, is constant on most maps. Depression contours are a special type of contour employed on some maps to indicate small basins or closed hollows in the land surface. The depression contour differs from the regular contour in having small ticks, or hachures, on the depressed inner part of the contour.

On some maps a color scale is used to show changes in elevation. Foreign maps frequently use hachures (shading) to show general elevation. Of the three methods, the contour map is the most accurate. See Map; Surveying.

CONTOUR FARMING, plowing, planting and cultivating at right angles to the slope in rolling or hilly country. Although it was practiced for centuries in Asia, especially in rice growing, the widespread

On slopes the contour furrow provides an effective way of holding rainfall where needed and prevents the soil erosion which occurs when furrows are made up and down hill.

use of this method is relatively recent in the United States. The plowman follows the contour of the ground, keeping at the same elevation, in contrast to the old method of plowing straight furrows regardless of rises and falls in the ground. Cultivation is around the hill, the object being to hold moisture on the slope and to control soil erosion. Terracing is a phase of contour farming.

Strip cropping—arrangement of narrow contour fields parallel with one another, such as fields of corn, oats, and clover—is associated with this system. Because of its advantages in consistently higher crop yields and in soil saving, it has gained favor among many farmers. Little more work is required in contour farming than is required in straight-row farming. It helps to prevent the formation of gullies and ditches and the consequent loss of valuable topsoil. See Agricultural Engineering; Erosion; Soil Conservation.

CONTRABAND OF WAR, goods for war purposes, bound for belligerent territory, which if captured, may legally be confiscated by the enemy. The law of contraband has developed as part of the law of neutrality from the time of Hugo Grotius in the seventeenth century.

With the emergence of national states and the dissolution of feudal obligations, states found themselves free to remain aloof from their neighbors' conflicts. The law of neutrality developed most rapidly on the seas as the result of the rapid development of maritime trade following the age of discovery of the fifteenth and early sixteenth centuries. Neutrals sought to continue their normal trade and even increase it at the expense of belligerents, and the clash led to the development of rules compromising the conflicting interests.

Acceptance of Principle. The law of contraband became established in the eighteenth century. In 1856, the Declaration of Paris provided that the neutral flag covered the enemy's goods with the exception of contraband of war. Neutral goods with the same

A contour map properly translates the land profile above.

exception were not liable to capture under the enemy's flag. All goods in time of war were understood by this time to be divided into three classes: (1) *contraband*, useful solely for war purposes, such as arms, ammunition, military clothing; (2) *conditional contraband*, goods useful for both war and peaceful purposes, such as coal, oil, provisions; (3) *free goods*, used solely for peaceful purposes in their existing form, such as raw materials; wool, hemp, flax, metallic ores, machinery for agriculture, furniture. Grotius had early essentially established these categories without using the word contraband.

Declaration of London. The United States and Great Britain, as the principal free-trade nations, had from time to time advocated abolition of the confiscation of private property at sea and even of the whole principle of contraband. Attempts to define the classes of contraband in detail had been made in treaties and declarations, but it was not until the International Naval Conference of 1908 that representatives of the major naval powers reached substantial agreement on a large number of items. The Declaration of London of 1909 contained extensive and detailed lists of specific articles in the three categories of contraband. Although it was not ratified extensively, the declaration carried great weight and was regarded then as embodying the generally accepted principles of the law of contraband. The Declaration of London provided that if the contraband goods formed more than half the cargo, the vessel itself might be condemned and the contraband goods confiscated on discovery.

While it has been extremely difficult to agree on articles that can be declared contraband, there has also been much disagreement as to the determination of the enemy destination of cargo. In time of war, neutrals frequently attempted to disguise the ultimate destination of goods by shipping through other neutrals. Under the generally accepted doctrine of continuous voyage, however, the ultimate destination is the determining factor as to liability. Belligerents seek to expand the list of contraband articles to prevent the maximum amount of goods of any sort from reaching the enemy. Neutrals hoping to continue as much of their trade as possible resist these efforts.

Breakdown of System. During World War I the Allies extended their lists of contraband articles until almost all imports of any kind were denied the Central Powers. The United States and other neutrals complained bitterly but to England the practice was necessary for survival.

In World War II the decline of the doctrine of neutrality caused by the events of World War I and the impact of the ideals of the League of Nations, prevented serious neutral complaints to British blockade practices, which from the first, in effect, prohibited all exports to Germany.

Contraband of war thus becomes a concept useful principally during the 100 years between Waterloo and Sarajevo. There is little likelihood that twentieth century conditions will permit a revival of neutrality and its related concepts. See International Law; War, Law Of; Neutrality; London, Declaration of; Paris, Declaration of. William C. Rogers

CONTRA COSTA CANAL. See Central Valley Project.

CONTRACT, a legally enforceable promise or set of promises. Both in legal and lay parlance a contract is often any significant agreement or the written instrument in which it is embodied.

The importance of contract varies with the nature of the economic and social system. In feudal times legal duties were determined largely by the status into which a man was born, and there was little opportunity to alter these rights and obligations by agreement. In a society organized upon totalitarian principles, also, the state fixes most of the legal relationships, and there is only a limited sphere for self-determination through contract.

In a market economy, on the other hand, freedom of contract is the rule. The classical economists placed great stress upon the necessity of leaving a wide area for the fixing of rights and duties through agreement and this ideal has been realized under modern democratic regimes to a considerable degree. Under a free enterprise system the institution of contract reaches its maximum importance.

In almost any system, however, some agreements are enforceable at law. Even before the Norman conquest, the early Anglo-Saxon law recognized several forms of contract concluded by giving as security an article of value, called a *wed*, or a personal surety, called a *borh*. The most common transactions were the betrothal and the settlement of the blood feud. In the feudal period the common law recognized the action of covenant for enforcing promises under seal and the action of debt for the recovery of amounts loaned or the price of goods sold. In the fifteenth century, a new form of action called *assumpsit* (a remedy for damages for the breach of a contract) made its appearance. Although narrowly limited in the beginning, it expanded rapidly as the needs of a growing market economy made themselves felt. And thus the modern law of contracts was developed.

Limiting Doctrines. But if in all systems of law some promises are enforced, it must also be said that in every system there are agreements which do not form the basis of any legal obligation. This is true even in a society that affords the maximum freedom of contract. A large part of the law of contracts is therefore concerned with differentiating between promises that are valid and enforceable and those which are not. Several limiting rules or doctrines in modern Anglo-American law are relevant here.

There is first the statute of frauds, which provides that certain kinds of contracts, including those for the sale of land, must be in writing and signed. Another important limitation is the doctrine of consideration, a survival from the action of assumpsit. In general, under this doctrine a promise is not legally binding unless some act or counter-promise is given in exchange for it. This is the consideration. It need not be of a value commensurate with the promise, but it must be bargained for and the performance of a prior legal duty or promise to perform such a duty is insufficient. In the case of a sealed instrument the common law did not require a consideration, but many states now have statutes abolishing or seriously limiting the effect of the seal. On the other hand, a few jurisdictions have enacted legislation excepting certain agreements from the consideration requirement.

The principles of moral consideration and promissory estoppel also represent relaxations of the strict doctrine, and these have been recognized by many courts. The former was introduced by Lord Mansfield in England in the eighteenth century, but it was later discarded there, except for a few special situations. Under this principle a promise to perform a prior moral duty will be upheld. Promissory estoppel is a more modern development, having its origin in cases in this country for recovery on subscriptions to charitable institutions. It is to the effect that a promise upon which the promisee has justifiably relied is in some instances enforceable, even though nothing has been given in exchange for it.

Contracts are unenforceable if they are for the performance of illegal acts or against public policy. Social legislation such as the wage and hour law has limited the area of free bargaining in the employment field. Insurance contracts are also strictly regulated with respect to the provisions which must be included or omitted. Under such laws parties are free to contract or not, but they have a restricted choice as to the terms of the bargain.

Interpretation. In addition to applying these rules of limitation, courts are often called upon to determine the meaning of the expressions which the parties use. The object ostensibly is to arrive at "the intent of the

parties." Although the courts constantly use this phrase, it must be admitted that there are many instances where the parties, although manifesting agreement, have actually attached different meanings to their expression. There was a time when the law seemed to require that the parties agree to the same thing in the same sense before a contract was formed. Although the classic expression "meeting of the minds" is still used extensively, it is understood that this refers not to what the parties actually had in mind, but only to their expressions.

It is also widely recognized that issues often arise in the course of the performance of a contract which were not anticipated when it was made, and there was therefore no intent at all with respect to them. For this reason circumstances surrounding the transaction and considerations of fairness must inevitably enter into the judicial process of construction. Since similar situations often recur, the courts have developed rules for determining the obligations of the parties with respect to matters for which they have made no provision, and these rules are also a part of the law of contracts.

Both obligations and conditions are often implied, and in some instances these implications are in accord with actual intention. Thus when a man calls a plumber to fix a pipe, he may not say a word about payment. Yet when the pipe is fixed, an obligation to pay arises and we know that both parties intended this result. An employee may agree without qualification to work for a certain period, but the law recognizes that the parties intended that this promise should be conditional upon the good health of the employee. These are examples of promises and conditions implied-in-fact.

Such implications are often difficult to distinguish from other obligations and conditions which are implied in law in order to do justice. Thus in the absence of a stipulation to the contrary, the seller in a sales contract, under certain conditions, is regarded as warranting that the goods are fit for the purpose for which they are intended. Obligations are sometimes imposed by law in the absence of any agreement at all, as where a physician seeks to recover a reasonable fee for rendering professional service to an unconscious patient in an emergency. In this situation the recovery is said to be based upon quasi-contract.

Not only obligations, but also conditions, are often implied although the parties may have given no thought to the matter. An unexpected intervening circumstance, such as war, may sometimes excuse performance, because the obligation of the contract is regarded as conditional upon a state of peace. In the case of issue of this nature, however, the circumstances are so variable that it is impossible to formulate definite rules.

The doctrines of offer and acceptance are often mentioned in connection with contracts. These doctrines are applicable principally to contracts by correspondence. Rapid methods of communication today have reduced their importance, although they are still extensively elaborated in treatises on the subject. Perhaps the best known rule of offer and acceptance is the one to the effect that where the offeree uses an authorized means of communication for acceptance, the contract is binding from the moment his message is sent.

Classifications. Contracts may be classified according to the factual nature of the transaction; thus we have contracts for the sale of goods, the sale of land, employment, building, loans of money, insurance, marriage, and for other purposes. They are also classified on a theoretical basis as unilateral or bilateral; executed or executory; formal or informal; valid, void, or voidable.

A unilateral contract includes a promise by one of the parties only, the consideration taking the form of an act or forebearance by the other. A bilateral contract, on the other hand, consists of mutual promises. This classification was introduced by legal scholars, but it is now accepted by the courts which are most under the influence of the schools. The distinction is easily stated but in practice it tends to be blurred.

An executed contract is one that has been performed, and sometimes one that has been performed in part. An executory contract is usually one with respect to which both sides have continuing obligations. This classification has been criticized by legal scholars on the ground that when a contract is fully performed it ceases to be one. The courts still find extensive use for these terms, however, even though their meanings are not very precise.

Formal contracts are those executed under seal and are often called specialties. If strict usage is followed, all others are called informal or simple, although they may be executed in a formal manner.

Void contracts are those which have no legal effect. There are some contracts, however, such as those obtained through fraud or duress, which only the innocent party may void. Such a contract is said to be voidable, and if the party having the election does not exercise his right seasonably after knowledge of the facts, it becomes mutually binding.

Remedies for Breach. In England and in certain of the United States only parties to a contract may have an action to recover for its breach. Exception has been made, however, for the beneficiary of a life insurance policy. In nearly all of the United States a person, although he is not a party to the contract, may recover for the breach of any contract if the parties appear to have intended to confer a benefit upon him. Moreover, even in the few jurisdictions which decline to accept this view, other ways are often found to permit recovery.

The principal contract remedies are an action for the recovery of money due by the party who has performed and an action for damages for the breach of a bilateral contract. In the case of this latter remedy, the amount recoverable is in general the sum required to put the plaintiff in the position he would have been in if the contract had been performed. The damages may be reduced, however, if the plaintiff has not taken all reasonable steps to mitigate them. Thus, in an action against an employer who has wrongfully discharged an employee, the recovery will be less, if the latter has not made diligent effort to obtain other employment. The damages are also limited to those which the parties could foresee when the contract was made.

In certain cases, notably when the contract is for the sale of land, the courts will decree specific performance. In other words, the defendant will be ordered to perform according to the terms of the contract, and, if he refuses to obey, he is subject to punishment for contempt of court. Frequently, however, specific relief is denied for reasons of public policy. To order the performance of contracts for personal service would result in involuntary servitude. Moreover, a judgment for damages is deemed an adequate remedy for the breach of most contracts.

See Consideration; Damages; Specific Performance; Supreme Court of the United States, *Historic Decisions*. Harold C. Havighurst

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CONTRACT BRIDGE. See Bridge.

CONTRACT LABOR is foreign labor hired under a formal agreement to work at a specified job for a number of years in order to repay the cost of transportation to the country offering employment. Under such agreements in the nineteenth century, Chinese

coolies were shipped to Hawaii, Chile, Peru, Cuba, British Guiana, and British and Dutch Malaysia for agricultural work; to South Africa for work in the diamond mines; and to France during war periods. The practice arose as a result of the scarcity of workers in newly opened countries and the failure of spontaneous immigration to supply adequate labor.

In the United States, various methods have been employed to procure sufficient immigration and labor; convict labor, contract (indentured) labor, and African slave labor were all results of the general shortage of man power. Most individuals brought into this country under formal indenture entered during colonial times, the practice being superseded by great increase in the slave trade. See INDENTURED SERVANT; SLAVERY.

Procurement of workers was conducted by intermediary agents; the agent has variously been a transportation company, the importing government itself as in the case of France and Australia, or natives of the foreign country. Under the padrone system originating in Italy, natives frequently became designated agents of foreign employers or, acting upon their own initiative, hired workers and later contracted for their transportation and employment abroad.

During the two decades immediately following the Civil War, the practice again expanded in the United States, but in somewhat different form. Employers themselves, or their direct agents, sought the foreign labor and made the terms of agreements. Such agreements were not formal indentures because they were not enforceable in the event the laborer wished to discontinue service, and it was relatively difficult for the employer to collect damages from a propertyless immigrant. However, most of these agreements were of fairly short duration and were carried out without difficulty. The American Emigrant Company was formed at the close of the Civil War expressly for the purpose of facilitating the immigration of contract labor, and an act was passed in 1864 which gave the system impetus by legalizing one year's forfeiture of wages under such agreements.

Toward the end of the nineteenth century native American labor strongly opposed uncontrolled immigration and the influx of cheap labor. Opposition to the importing of contract labor arose as a phase of this general movement. The Alien Contract Labor Bill and its subsequent amendments, passed between 1885 and 1888, provided for deportation of labor then under contract and prohibited solicitation and entrance of unskilled foreign workers; domestic servants and skilled workers were at first exempt with the approval of the secretary of labor but were later included by congressional action in 1903 and 1907. Thus, the practice has since been prohibited with the exceptions of the importation of Mexican labor and some professional workers during World War I and certain instances during World War II. See IMMIGRATION; LABOR.

CONTRALTO, the female voice of lowest range. In seventeenth and eighteenth century choral music alto parts were sung by male sopranos (*castratos*), to which contraltos sang a counter-part—hence contra-alto; later, after the practice of creating male sopranos was abandoned, contraltos sang the parts originally written for *castratos*. Women also began to appear on the operatic stage in male soprano roles, such as that of Orpheus in Gluck's *Orpheus and Euridyce*, and eventually the tradition became so firmly established that later composers wrote roles of boys and young men that were to be sung by contraltos, such as that of Cherubino in Mozart's *The Marriage of Figaro*, and Octavian in Richard Strauss' *Der Rosenkavalier*.

The contralto's range usually consists of the octave below and the octave above the E above middle C; it occasionally ranges higher, but always retains the peculiarly heavy quality of the lower range, a feature which distinguishes it from the mezzo-soprano. A voice of dark color, rich quality, and great depth, the true contralto is exceedingly rare, and probably for this reason has been much neglected, although a few composers have written works especially for it, such as Brahms' *Alto Rhapsody*. The Delilah of Saint-Saëns' opera *Samson and Delilah* is a contralto, as are Bizet's Carmen, and Amneris in Verdi's *Aïda*. See VOICE.

CONTRECOEUR, PIERRE CLAUDE PECAUDY, SIEUR DE, 1730?–?75, French soldier. In 1754 he led a French force of 1000 men, mostly Indians, which drove the British from fortifications at Ohio Fork, and completed building Fort Duquesne. After Gen. Edward Braddock's defeat, 1775, Contrecoeur, who was erroneously credited with the victory, was largely responsible for the atrocities committed by the Indians.

CONTRERAS, BATTLE OF, one of the engagements fought in the Mexican War by Gen. Winfield Scott, Aug. 19–20, 1847, during the approach to Mexico City. The Mexicans, under Generals Gabriel Valencia and Antonio López de Santa Anna, occupied a strong position on rising ground near the village of Contreras, about 12 miles southwest of Mexico City. On the morning of August 20, the United States troops had found a way across the protecting lava bed and attacked from both front and rear. The American forces numbered 4500 men, of whom fewer than 100 were killed or wounded; the much larger Mexican force lost about 1500 killed or captured.

CONTRIBUTION, in general, the act of giving conjointly with others. In law, it denotes a payment made by each of several persons as his share in a common loss or a common expense. In Maritime Law the principle is exercised when losses have arisen from the sacrifice of the cargo to prevent the ship from destruction or capture.

In U.S. politics a contribution is a payment made to a political party, usually during an election campaign. Federal law now prohibits corporations from making contributions to any political party in any election in which federal officers are elected; corporations incorporated under federal law are forbidden to make any political contributions; most states likewise forbid such contributions. Although contributions continue to be made they are ostensibly paid by individuals. The Hatch Act forbids the imposition of political assessments on federal employees, but here again the law is often disregarded. See CORRUPT PRACTICES ACT; MARITIME LAW.

CONTRIBUTORY NEGLIGENCE. See NEGLIGENCE; EMPLOYERS' LIABILITY.

CONTROLLER. See COMPTROLLER or CONTROLLER.

CONTROL SYSTEM, INDUSTRIAL. See INDUSTRIAL ORGANIZATION AND MANAGEMENT.

CONTROL SYSTEM, MACHINE. See AUTOMATIC MACHINE; AUTOMATION; CALCULATING MACHINE; ELECTRONICS; INSTRUMENTATION; SERVOMECHANISM.

CONTUCCI. See SANSOVINO, ANDREA.

CONTUSION. See BRUISE.

CONULARIDA is a group of small extinct marine animals belonging to the phylum Coelenterata (see COELENTERATA) and known only from their conical or pyramidal-shaped fossil shells. The chitinous shells are open at the larger end and closed at the smaller end. Once considered as mollusks, the members of this group are known as early as the Lower Cambrian (see GEOLOGIC TIME). Typical of the group is the genus *Conularia*, examples of which are known from eastern Canada and the entire United States.

CONVECTION is the transmission of heat from one point to another by means of a circulating medium such as air or water. The density, or weight per unit volume, of a fluid or gas decreases with an increase in temperature. If the air in a room is heated, it will become less dense, rise toward the ceiling, and

allow the unheated, cooler air to take its place near the heat source. The rate of convection can be increased by increasing the temperature difference and distance between the heated and unheated air. Similar phenomena occur in circulation of water in a hot water heating system.

Convection of air masses over the earth follows the same principles. As the radiation from the sun heats the air near the Equator, that air becomes less dense, rises, and travels toward the poles where it is cooled. As the air cools, it becomes more dense, returns to earth, and travels in the direction of the Equator again (see DOLDRUMS). See HEATING AND VENTILATION.

CONVENT, in the Roman Catholic church a religious community of men or of women; more commonly, an abbey, monastery, or priory occupied by such a community. A convent usually has a chapel, a chapter house where community problems are discussed, a dining room, a dormitory, an infirmary, a parlor for visitors, a library, a place for recreation, and a crypt for burial.

In the United States a convent is a nunnery or home for nuns, the corresponding establishment for monks being called a monastery; in Europe, however, the broader meaning is still used for both sexes. Convents are normally classified as enclosed or unenclosed; in the former the nuns devote themselves to praying for the souls of themselves and others, to seclusion, and mortification, while in the latter the sisters engage in education and social service. During the Middle Ages convents were founded for seclusion and contemplation, but in modern times many have been organized for social service. See ABBEY; CLOISTER; MONASTICISM.

CONVENTION, in general usage, a rule of conduct established by custom or agreement; in diplomacy and in military affairs, an international compact or agreement other than a treaty; in a political sense, an extraordinary gathering of representative delegates for a definite purpose.

Many international conventions, usually involving a number of states, have been made since 1860. Important among them were the Geneva conventions of 1864 and 1906, providing humane conduct of war; the Hague conventions of 1899 and 1907, dealing primarily with the rules of war; the International Postal Convention of 1874; conventions of 1883, 1900, 1911, and 1925, dealing with the international regulation of trade-marks; the Air Navigation Convention of 1919; Pan American Convention on Commercial Aviation of 1928; the Convention on Civil Aviation of 1944; Genocide Convention of 1948; the Convention on the Political Rights of Women of 1952; and the Universal Copyright Convention of 1955.

Delegates to the Republican national convention of 1952 accorded an ovation to former President Hoover, left, who addressed the delegates in his return to political life. UP

Politically a convention is to be distinguished from the formal meeting of a regularly constituted legislative body, although such a body could be a convention when irregularly convened. Parliaments in British history which have met without the royal summons have been known as conventions—notably the Convention Parliament or Free Convention of 1660, which restored Charles II to the throne; and the meeting in 1689 of the Lords and Commons on the summons of the Prince of Orange, to transfer the succession of the crown and kingdom from the House of Stuart to William and Mary. The First French Republic was established by the Convention of 1792, and the government was in its hands until it was assumed by the Directory in 1795. In the United States joint meetings of the two houses of Congress and of the state legislatures are sometimes designated as conventions.

Constitutional conventions are bodies of elected representatives chosen for the specific purpose of framing or revising national or state constitutions, such as the constitutional convention at Philadelphia in 1787 and, on the state level, constitutional conventions in New Jersey, 1947, and New Hampshire, 1948.

Political conventions in the United States are local, state, or national assemblies of representatives of the various political parties to select candidates for elective offices. Prior to 1824 candidates for the office of the president of the United States were nominated by the congressional caucuses. The first national convention was called by the anti-Masonic party at Baltimore in 1831, and since that time all presidential nominations have been made at national conventions in which the state representation is usually determined by the number of electoral votes, senators and congressmen from the state, and the party vote polled at the preceding elections. A simple majority vote is now required for nomination; unlike its Republican counterpart, the Democratic national convention operated until 1932 under rules requiring a two-thirds vote for nomination. The so-called state-unit rule makes it optional for each state delegation to vote as a unit. Besides nominating candidates for president and vice-president, each national convention must also draw up the party platform and elect a national committee to conduct the campaign; actually each national convention ratifies whatever choice of committeemen has been made by the party in each state.

Formerly the party conventions were also used on state and local levels for the nomination of candidates. By 1917, however, the direct primary has been substituted for the convention in all but four states. But even under the direct primary it is still necessary to hold state and local party conventions to draw up platforms and to attend to other matters pertaining to political campaigns. See CONSTITUTION OF THE UNITED STATES; CONSTITUTIONAL CONVENTION; ELECTION; REPRESENTATION; REPUBLICAN PARTY; DEMOCRATIC PARTY.

CONVERGENCE. See SERIES, *An Infinite Series.*

CONVERSE, FREDERICK SHEPHERD, 1871–1940, U.S. composer, was born in Newton, Mass. He was graduated from Harvard University, 1893, where he later taught, and studied with Joseph Rheinberger in Germany. After 1930 he was dean of the faculty at the New England Conservatory of Music. His *The Pipe of Desire* (1906) was in 1910 the first opera by a U.S. citizen to be performed at the Metropolitan Opera House, New York. Other works include *Flivver Ten Million* (1927) and *American Sketches* (1929).

CONVERSE COLLEGE. See COLLEGES.

CONVERSION, in law, is an unauthorized or unlawful taking of personal property and assumption of ownership over it. The taking may be with honest intention or it may be with dishonest intent, in which case it may also constitute larceny. The person entitled to possession may replevin the goods or sue for damages. One who abets another in keeping property from its rightful owner is guilty of conversion.

Equitable Conversion is the constructive changing of real estate into personal property, or personalty into realty, under certain rules in equity. It is a familiar maxim that equity considers as done that which ought to be done. Therefore, when a will or conveyance contains a valid and enforceable direction to convert the real estate conveyed into personalty, it is treated as if this had already been done by courts of equity. This maxim is also applied to contracts affecting marriage settlements, and to some extent to contracts for the sale of real estate. The doctrine is of importance in determining the character of property conveyed. For example, if real estate is converted into personalty immediately on a testator's death, dower rights will not be vested in a beneficiary's wife, and judgments against him will not attach as liens. See Equity; Larceny.

CONVERSION, medically, is a subconscious process by which repressed emotional experiences are expressed as a physical disability. A disability may be created by altering or stopping a physical function temporarily. Only voluntary muscle and special sensory organs will respond to a conversion reaction. Anxiety which cannot consciously be experienced may be converted into functional symptoms. While these physical symptoms serve primarily to lessen or prevent anxiety, they also may be symbolic of the underlying conflict producing the anxiety. For example, an individual may develop a hysterical paralysis in order to evade a situation he does not wish to face. A true conversion reaction is never a conscious act. When physical or mental disturbances are consciously simulated by an individual for his ultimate gain, the individual is a malingerer. Contrariwise, conversion provides relief from anxiety without conscious effort. See Anxiety; Hysteria; Psychoneurosis.

CONVERSION, a spiritual and moral transformation in the life of a person. Conversion may involve one or more (or all) of the following changes: from unbelief to faith, from a life of sin to a life of grace, from a materialistic outlook to a spiritual attitude, from doubt and despair to trust and hope, from a disorganized life to one organized on a spiritual purpose. In Christian lands conversion often means the acceptance of the Christian faith by someone from another religion; it may also mean the transfer of a Christian from one communion to another of radically different tradition and doctrine. Conversion may be instantaneous and dramatic or gradual and unconscious. In dramatic form it is accompanied by deep emotion and is often called a "new birth" or "rebirth." One of the greatest of conversion experiences was that of Saint Paul on the Damascus Road, when he was transformed from Saul the persecutor of the church to Paul the apostle of Christianity. George Fox, the founder of the Society of Friends, exclaimed after his conversion that he "came up through the flaming sword into the paradise of God." John Wesley, the founder of Methodism, testified that he felt his heart "strangely warmed."

CONVERTER, in metallurgy, is a vessel used in several steelmaking processes. The Bessemer type has been the most common (see Bessemer Steel). The oxygen converter is an open-topped vessel lined with refractory materials. After it has been charged with molten iron, oxygen is blown down on the top of the pool of metal to burn out excess carbon and other impurities. The converter process is faster than the open-hearth process, and the steel made compares favorably with open-hearth steel. See Steel, *Steelmaking Processes.*

CONVERTER, ELECTRICAL, is a rotary device for changing electrical energy from one form to another, usually from direct current to alternating current or from alternating current to direct current. A converter that changes direct current to alternating current resembles a motor and runs as a motor when direct current is fed into it. Its armature, a rotating magnet, induces an alternating current, and this is led off by collector rings and delivered to the point of use. In converting alternating current to direct current, as in streetcar-line power stations, incoming alternating current powers alternating-current motors that drive direct-current generators. See Generator and Motor.

CONVEX LENS. See Lens.

CONVEYANCING is the art of creating, transferring, and extinguishing legal rights over real property, sometimes over personal property also. In ancient times, delivery, actual or constructive, by which the grantee or transferee was put in possession of the property, was necessary to effect a conveyance; and even after the introduction of written instruments this rule continued in force. The Roman lawyers said, "By delivery and prescription, not by bare agreement, is the ownership of property transferred." In accordance with strict feudal principles land could only be conveyed by symbolical delivery of a part of it—a clod of earth and a stone; and this was the law of Scotland until 1845. In England, symbolic delivery was not insisted on, provided the parties went in sight of the land, and the grantor then declared that he gave seisin (see Seisin).

A written grant has been for a long period indispensable over and above symbolical delivery, and delivery of seisin is now obsolete in both England and those few parts of the United States where it took root. In this country real property is generally conveyed by an instrument of bargain and sale, which must generally be recorded in a public register. Goods and chattels are, as a rule, transferred by actual delivery; but a bill of sale is also competent, more particularly in the case of ships, and where actual delivery is impossible.

The preparation of legal instruments should be in the hands of competent practitioners. In England the highest branches of the work are performed by barristers, who make it their special sphere. In some parts of the United States conveyancing is done by companies which guarantee the validity both of the documents themselves and of the title conferred. It is not as a rule necessary that a conveyancer should be a qualified lawyer, though he generally is so. In old countries with a system of land tenure which dates back for many centuries and which has constantly been undergoing modifications, conveyancing has often developed into a system of vast complexity. This is particularly so in England, and many attempts have been made to remedy the defect. In newer countries the forms are usually much simpler.

The instrument of conveyance by which real estate is transferred is known today as a deed. It should contain the names of the parties; words of conveyance describing the tenure, as to A, or to A and his heirs forever, by which a fee would pass, or to A for life, etc.; describe the property accurately; and may contain certain covenants on the part of the grantor as a covenant for quiet enjoyment, or a warranty of the title. The instrument is dated and is under seal, and in most states in order to be recorded it must be witnessed or acknowledged before a notary or other proper officer. It is not necessary to name the consideration. If the property is subject to mortgages or other liens, these should be mentioned and either described or the names of the parties and time and place of record set forth. Personal property is sometimes transferred by an instrument known as a bill of sale, which is less formal than a deed. See also Bill of Sale; Deed; Recording Act; Title.

CONVEYING AND ELEVATING MACHINERY is machinery used for transporting materials and sometimes persons horizontally, vertically, or on an incline. Such machinery has become an essential part of modern industry and agriculture by reducing the manual effort formerly required to perform heavy hazardous tasks, by handling materials that could not be handled by nonmechanical means, and by lower-

ing production costs. Giant steam plants that generate electricity could not operate without high-capacity coal-handling equipment. Steel mills, chemical plants, cement factories, and manufacturing plants of all kinds also depend on conveyors. Mass production depends completely on conveying systems to move parts and subassemblies along the assembly lines. Modern industry, in fact, would be impossible without the complex conveying and elevating systems that it has developed to transport materials in whatever quantity needed. Production in many operations is governed largely by the efficiency of the conveying methods used to handle the materials involved. (See ASSEMBLY LINE; MASS PRODUCTION.) For descriptions of machines that transport persons and freight between different levels of buildings, see ELEVATOR; ESCALATOR.

Almost any substance can be handled by conveyors, but the problems involved with bulk materials often are much more difficult than those encountered in handling packaged materials or individual objects. Bulk handling capacities required, for example, may range from a precise dribble to thousands of tons an hour. Particle size may run from very fine to rather large, and frequently one conveyor has to handle a material that is a mixture of particle sizes. Also, the material may be dusty or sticky, free-flowing or sluggish, heavy or light, fragile or hard, abrasive or nonabrasive, solid or liquid. Materials that are highly corrosive or poisonous require special handling precautions quite apart from their physical characteristics. Because of these considerations many different types of conveyors have been developed. Engineers choose the best one for a particular application after they have studied all the characteristics of the material to be handled and the demands that will be made of the conveyor in service.

CHAIN CONVEYORS

Conveyors in this classification consist of a carrying element attached to or a part of a chain or several chains (see CHAIN, *Conveyor and Elevator Chains*). Many arrangements of chain and carrying element are possible, each with its own advantages for particular situations. Sometimes wire cables are used in place of chain.

Drag or Scraper Conveyors consist of endless chains, with transverse elements attached at intervals, moving in a trough. The drag-chain type usually consists of a single chain widened at intervals by "buttons" cast integrally with some of the links. It is often used to transport soda ash, cement, clinkers, and light chemicals. The chain moves through the trough, simply dragging or scraping the material along with it. Drag-chain conveyors require little space, and they can easily be enclosed to keep dust from escaping. However, there is so much friction that chain strength and power requirements limit them to short lengths.

Flight conveyors consist of flights (transverse bars or plates of wood or steel) mounted at planned intervals on one or more strands of chain. Most often there are two strands and the flights are suspended between them. The chains frequently run on tracks alongside the trough, and only the flights operate in the trough. This feature lengthens chain life. Flight conveyors frequently have larger capacities than drag-chain conveyors; otherwise, both types have much the same advantages and limitations. Flight conveyors are often used on farms, sometimes as simple conveyors for moving and elevating grain, ear corn, and bales and sometimes as parts of such complex machines as corn shellers. They are also used in canneries and other industrial plants.

Carrying Conveyors carry the material rather than push it along. The apron type consists essentially of overlapping carrying pans fastened to two strands of chain running on tracks. It is versatile and widely used for handling almost any conveyable material, from loaves of bread in bakeries to broken rock in quarries. Slat conveyors are similar but carry the load on slats rather than on overlapping pans. Horizontal bucket conveyors consist of a series of buckets, each fitted with its own carrying wheels and attached to a chain that relays the motive power.

Elevating Conveyors include all chain conveyors used for elevating material at a steep angle. This angle is arbitrarily defined as being from 45° to 90°. Bucket elevators, the most common type, consist of buckets mounted on one or two endless chains. The buckets receive the material to be elevated at the lower end of the elevator and carry it to the upper end where it is discharged by gravity, centrifugal action, or a combination of these forces. Bucket elevators are often used for abrasive and lumpy materials because the material is loaded directly into the buckets without any digging action required of them. They usually operate at low speed, and this is an advantage when handling material that must not be broken up.

Continuous-flow conveyors consist of enclosed ducts through which runs an endless chain with flights attached at intervals. The flights do not simply push the material along but rather induce a mass movement in it like the movement of a liquid through a pipe. The material thus moves as a continuous column, and feeding and discharge are smooth and continuous. Continuous-flow conveyors are generally used for granular materials and can carry them in paths that combine vertical, horizontal, and inclined runs.

Skip hoists consist of a bucket operating in guides and suspended from a hoist-operated chain or cable. They are especially suited for high lifts and

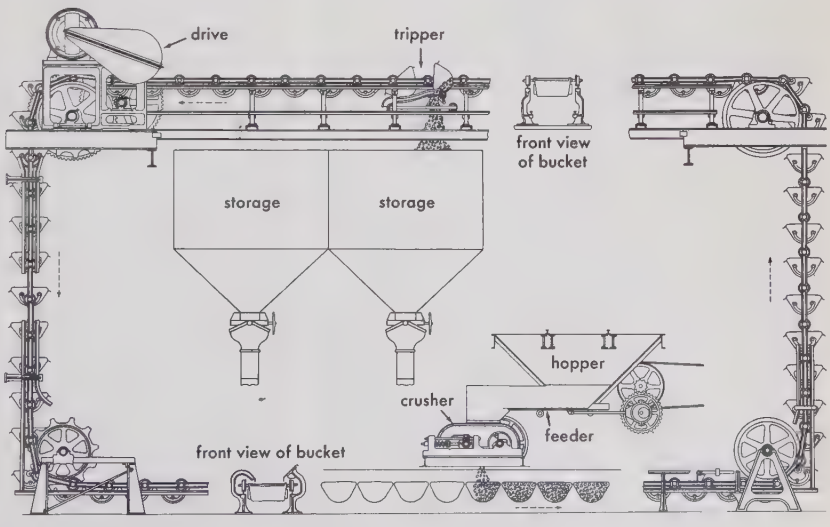

Diagram of Peck Carrier Installation Showing Feeding and Discharge

LINK BELT CO.

Nearly 10 miles long, the 36-inch belt conveyor, left, moved 1100 tons of aggregate per hour during the building of California's Shasta Dam. The strip mine screw conveyor, center, moves wet coal from draining bins to the dryers. The chain unit, right, increases paper mill production by bringing up 25 cords of pulpwood per hour from flume to grinder floor.

can be used for any bulk material, including those made up of large lumps. Their intermittent operation, however, makes them incapable of providing a continuous flow of material. Skip hoists are used for such work as charging blast furnaces and hoisting concrete mix to the upper floors of a building during construction.

Peck carriers are combination elevators and conveyors consisting of buckets pivoted between two endless chains running on lubricated rollers. The buckets remain in the carrying position in all parts of the system until a tripping mechanism tilts them at the point where their loads are to be dumped. Peck carriers operate at low speed and handle materials gently. They are often used in chemical plants for carrying hot, abrasive, or corrosive materials. They also convey coal to furnaces.

Gravity-discharge elevator conveyors are somewhat similar to Peck carriers, but the buckets are rigidly attached to the chains and thus remain in the carrying position only in the vertical and steeply inclined ascending parts of the system. In the horizontal and slightly inclined parts, the buckets simply push the material along troughs. The material is discharged by gravity through openings provided at desired locations in the troughs.

Trolley Conveyors support the load on wheels, and motive power is supplied through a chain. The overhead type, which is one of the most widely used conveyors in industry, consists of a power-propelled endless chain suspended from an overhead track by trolley wheels. Because the chain is flexible, the track can be curved vertically and horizontally. In manufacturing plants, the track is kept close to the ceiling where headroom is required and brought down nearer the floor in working areas to bring the materials into reach. A great variety of parts and products can be carried by the many types of hooks, racks, trays, slings, baskets, and buckets that can be attached to the chain singly or in groups. Advantages of overhead trolley conveyors include the fact that they use space that otherwise would be wasted, they are easily installed and maintained, and they can be extended, shortened, and rerouted with little trouble. They are used in automobile plants and in many other places where parts and subassemblies must be brought together for processing or further assembly. Sometimes they are used to store the parts, supplying them to assembly stations as needed. They have also been used in outdoor cross-country installations for transporting bulky material such as coal.

Industrial-truck draglines move industrial trucks over a predetermined path by means of a powered endless chain located overhead or in the floor. They link receiving, storage, sorting, and shipping operations with an orderly flow of traffic in warehouses, factories, and truck and railroad terminals.

Screw Conveyors

These consist of a spiral screw rotating in a trough or tube. Material fed into the trough or tube is moved along by the rotation of the screw, which is supported at intervals by bearings. Inlets, outlets, gates, and other accessories control the material and its disposition. Screw conveyors are compact and therefore are especially useful in cramped locations. Another advantage is that they do not require an empty return run as do most other conveyors. They are not generally used for handling material in large lumps, fibrous or stringy materials, or very abrasive materials.

Types of Screws. Helicoid-flight screws are made up of a spiral (the "flight") rolled in one piece and mounted on a shaft. Sectional-flight screws are made up of individual stamped or cast sections riveted or welded together and fastened to a shaft. Cut-flight screws have the edges of the flight notched to give a moderate mixing action along with the conveying action. Ribbon-flight screws have the flight secured to the shaft by supporting lugs but separated from it by open space; they are used for handling sticky material like molasses and asphalt that would build up along the line between the flight and the shaft of a regular screw. Paddle screws are made up of separate blades mounted on a shaft at regular intervals; they are used for mixing, blending, or stirring dry or fluid materials while conveying them. Short-pitch screws have a tighter spiral than regular screws and are used in vertical elevators and in inclined conveyors when the slope is 20° or more. The short pitch of the screw increases efficiency in these applications. Screws are usually made of steel or cast iron, but noncorroding metals may be used in special cases.

Uses. Screw conveyors are widely used in industrial plants where bulk materials are handled. They also are used on farms for conveying and elevating grain and as feeder mechanisms in balers, combines, and other farm implements.

Oscillating Conveyors

These consist of a trough and a mechanism that moves the trough back and forth rapidly in such a way as to propel loose material along the trough in

a gentle continuous flow. The bottom of the trough may be a solid plate or it may be a screen to cull out fine material. There are no moving parts or bearings in contact with the material being moved, so oscillating conveyors are advantageous for abrasive materials such as ores, sand, castings, and clinkers. They also are used for handling fine, lumpy, stringy, and hot materials that may be difficult to handle in other conveyors.

Belt Conveyors

These use endless moving belts for transporting materials horizontally or on an incline. A typical belt conveyor consists of five essential elements—the belt, idler rollers that support the belt and its load, a pulley or pulleys that drive the belt, a drive that powers the pulleys, and a supporting structure. Auxiliary equipment places material on the belt, and material is discharged over the head end of the conveyor or is taken off at the desired point by unloading devices. Belts are usually made of rubber-coated fabric. Those intended for heavy duty often have steel cables embedded in them to take the tension. The idler rollers of belt conveyors used for bulk materials are arranged so as to give the belt a troughed shape.

Uses. Belt conveyors can be used for handling practically all pulverized, granular, and lumpy materials either wet or dry. Practically the only limitations are temperatures of materials high enough to scorch the belt, slopes so steep that the material slides, and overload. Maintenance costs after the initial investment usually are low, even when very large tonnages are handled. In one installation, for example, two 30-inch belt conveyors, one 300 feet long and the other 400 feet long, carried crushed coal to a steam plant for 11 years at a total maintenance cost of about $400. Some 449,000 tons of coal were handled, and at the end of the 11 years the original belts were still in service and in excellent condition.

A spectacular application was the system of conveyor belts installed in 1940 to deliver concrete aggregates to the Shasta Dam project in California. It stretched about 9½ miles overland from the preparation plant to a storage yard near the dam site, and it moved about 7.6 million tons of gravel and 2.8 million tons of sand. There were 26 conveyor units in the system.

An example of the heavy-duty conveyors installed in recent years is the 4200-foot slope conveyor at the Waltonville, Ill., mine of the Chicago, Wilmington and Franklin Coal Company. It conveyed coal from the mine on a 42-inch belt with a lift of 862 feet. Handling rate was 1200 tons an hour and belt speed 625 feet a minute. Use of belt conveyors in mining has increased steadily and has greatly improved safety and efficiency. See Coal and Coal Mining.

In newspaper publishing a specialized belt conveyor made of coiled steel wires moves finished newspapers away from the high-speed presses. This conveyor is driven from the folder of the press through a chain drive so that it operates in unison with the folder. Newspapers are folded mechanically and thrust into the wire coils, which grip the papers and move them along in a steady flow. The gripping action makes it possible to lead the conveyor up walls and along ceilings, and pressroom designers take advantage of this to minimize the space required by the conveyor and to use space that otherwise would be wasted. The conveyor leads to rooms where the papers are bundled for distribution. A mechanical device knocks a paper slightly askew at predetermined intervals to help bundlers count out the papers in the desired numbers.

Moving Sidewalks are specialized flat belt conveyors used for transporting people. They move slowly enough so that there is no hazard in stepping on and off them, and they are sometimes wide enough to accommodate several persons abreast. One typical moving sidewalk carried foot traffic part of the distance across a ravine separating a municipal auditorium from its parking lot.

Hydraulic and Pneumatic Conveyors

Hydraulic Conveyors consist of pipes or open troughs with water directed into them under pressure. Coal or other bulk material is moved with the water to the discharge point, where the water is separated from the material. Hydraulic conveyors are often used to remove ashes from the ash pits of large furnaces and convey them to a disposal area.

Pneumatic Conveyors make use of air blown by fans through closed pipes. If the air velocity is high enough the material is picked up and carried in suspension, causing little erosion in the system except at bends. Pulverized mineral products are often handled by pneumatic conveyors, especially where they must be moved to storage bins and later removed from storage. The systems can be completely enclosed for dustless operation. There is no dust problem at the intake end because the conveyor simply sucks in the material like a vacuum sweeper and does not stir it up. Shelled corn and small grains are unloaded from barges and railroad cars and moved to storage by pneumatic conveyors. Bulk cement is also handled by pneumatic conveyors. Pneumatic conveyors for transporting mail and other messages in cylindrical containers are called pneumatic-dispatch systems (see Pneumatic Dispatch).

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CONVICT. See Prison.

CONVICT LABOR. See Prison.

CONVOCATION, an assembly of persons called together by a summons; specifically, a meeting of clergy in the Church of England by the archbishop to consider ecclesiastical affairs, a conference of clergy in the Protestant Episcopal church, and an assembly in certain schools and universities. In the Anglican church the provinces of Canterbury and York each has its convocation; each body has two houses, the upper consisting of the bishops, the lower representing the inferior clergy, but in York it is customary for the two houses to meet together. In the Protestant Episcopal church a convocation is a voluntary assembly of the clergy for the discussion of matters of common interest. In some English universities a convocation is an advisory body, consisting usually of graduates; in some American and Canadian universities a convocation is an assembly which meets to confer degrees. Popularly, meetings of entire student bodies of secondary schools for school purposes are convocations.

CONVOLVULUS, commonly called bindweed, is a genus of annual and perennial herbs of the morning-glory family, *Convolvulaceae*. There are some 150 species in the genus. The plants are chiefly climbers or trailers and are widely distributed. The annuals are raised from seed sown in the spring; the perennials are generally propagated by root division or, in the case of the greenhouse species, by cuttings. The perennial species sometimes spread so rapidly as to become a nuisance in gardens. Satisfactory control may be effected by using 2-4 D. The hardy bindweeds grow easily in any garden soil. The flowers are funnel-shaped and of many colors. *C. arvensis* is a pretty trailing or twining perennial species, naturalized from Europe, bearing white and pink flowers in summer. It is often considered a weed. *C. Cneorum*, a small shrub with white or pink flowers is not quite hardy, but is a good greenhouse or window plant. *C. Scammonia* is a hardy trailing plant bearing cream-colored flowers. Its root provides the drug scammony root. *C. tricolor* is a hardy annual dwarf. Its flowers are blue, yellow, and white and are borne profusely throughout the summer. The common wild morning-glory, or bindweed, is *Ipomoea hederacea*.

U.S. NAVY

Big convoys were common on the sea lanes in World War II. This one was on a run to Casablanca in June 1943, when the German submarine activity was waning but still dangerous.

CONVOY, an escort composed of warships of various types to a group of cargo or troop ships during wartime. Convoys were customary in sailing ship days; German U-boat attacks on merchant shipping in World War I proved the necessity for reviving the convoy system. During World War II ocean convoying was undertaken on a vast scale. Not only surface craft rode protection on shipping; aircraft carriers also accompanied such groups and sent their planes aloft constantly. Blimps, nonrigid lighter-than-air craft, and helicopters also flew coastwise convoy duty on port-to-port trips. The threats from dive bombers and torpedo bombers that also attacked Allied convoys were met by aircraft planes and by shore-based aircraft. During World War II one of the largest convoys in history sailed from the United States to Soviet Arctic ports; 75 warships guarded the cargo vessels, whose number ran into the hundreds.

A body of troops, such as a truck convoy or a motorcycle convoy escorting persons, goods, or ammunition trains, is also known as a convoy.

CONVULSION is a seizure in which there is an involuntary contraction or series of contractions of muscles that are ordinarily under voluntary control. If the convulsion is a continuous contraction accompanied by rigidity it is termed *tonic;* if the series of contractions alternate with periods of relaxation, the convulsion is *clonic.*

Convulsions are not an uncommon occurrence in infants and children, and occur more frequently during the first two years of life than during any other period. As the child grows older convulsions caused by such stimuli as a sudden drop of temperature tend to lessen.

Both acute, or nonrecurrent, and chronic, or recurrent, forms of convulsion occur. The major causes of acute convulsion include any of several infectious diseases, poisoning with a convulsant drug, injury to the brain, hemorrhage, tumor, and asphyxia. Chronic convulsion in the greatest number of cases is a manifestation of epilepsy (see EPILEPSY). Other causes of chronic convulsion include narcolepsy, cataplexy, hysteria, tetany, uremia, allergy, and migraine. (See CATAPLEXY; HYSTERIA; MIGRAINE; UREMIA.) Patients experiencing convulsions must be placed in a position that will not allow them to fall. Biting of the tongue should be prevented by placing a padded gag between the patient's teeth. At no time should the fingers be used to keep open the patient's mouth. If breathing has stopped, artificial respiration should be given. In any event a physician should be called immediately.

CONWAY, THOMAS, 1733–?1800, Irish-born soldier of fortune, was educated in France and served with the French army, 1749–76. He came to America in 1777 and fought with the Continental army at Germantown as a brigadier general. Promoted to major general in December 1777, he had a minor role in the Conway Cabal (see CONWAY CABAL). When his role was discovered Conway resigned and returned to France, where he rejoined the army in 1779. He became governor general of French possessions in India in 1787.

CONWAY, city, central Arkansas, county seat of Faulkner County, on the Missouri Pacific Railroad, and on U.S. highways 64 and 65; 27 miles NNW of Little Rock. Situated in an agricultural area with cotton the principal crop, Conway's manufactures include farm machinery, dairy products, bus bodies, fishing tackle, boats, furniture, and shoes. It is the site of Arkansas State Teachers College and Hendrix College. The city was founded in 1871. Pop. (1955) about 9700.

CONWAY, town, E central New Hampshire, in Carroll County, at the confluence of the Saco and Swift rivers; on the Boston and Maine Railroad; on state highway 16; 58 miles NNE of Concord. Conway is situated at the southeastern edge of the White Mountain National Forest and is a summer resort. Its major industry is the manufacture of wood products. Pop. (1955 est.) 4200, including North, Center, and South Conway, Conway Street, Kearsarge, Redstone, and Intervale.

CONWAY, town, E South Carolina, county seat of Horry County, at the head of navigation on the Waccamaw River, 12 miles from the Atlantic Ocean; on the Atlantic Coast Line Railroad; and on U.S. highways 378, 501, 701; about 86 miles NE of Charleston. The area around Conway produces tobacco, truck crops, strawberries, melons, and lumber. The city has lumber mills and manufactures textiles. Conway was established as Kingston on land granted by George II of England, it became known as Conwayborough in 1801 in honor of Gen. Robert Conway. The present form of the name was adopted in 1898. Pop. (1955) about 6500.

CONWAY, or Aberconway, municipal borough, N Wales, in NE Carnarvonshire, on the estuary of the Conway River, 14 miles ENE of Bangor. Conway is an agricultural market, commercial center, and summer resort. The Conway River is crossed by two notable highway and railroad bridges, one designed by Robert Stephenson and the other by Thomas Telford. The town is enclosed by an ancient wall with gates and round towers. The castle was built toward the end of the thirteenth century and is a fine example of a medieval fortress. Other features of Conway are the ruins of a twelfth century Cistercian abbey and the Tudor mansion Plas Mawr, childhood home of Queen Elizabeth I, now the headquarters of the Royal Cambrian Academy of Art. Pop. (1951) 10,237.

CONWAY CABAL, a supposed plot on the part of some generals in the Continental Army, among them Gen. Thomas Conway, and members of Congress, to replace George Washington as commander in chief in the fall and winter of 1777–78. The purported successor was to be Gen. Horatio Gates, especially after his victory at Saratoga. Washington himself took note of the affair by writing to Conway saying he had received a letter reporting that Conway had been critical of the commander in chief in a letter to Gates. The resulting publicity strengthened Washington's position. Some modern scholars doubt the existence of an organized conspiracy, though there is no doubt of the opposition to Washington. See GATES, HORATIO; MIFFLIN, THOMAS.

CONWAY RIVER, N Wales, Carnarvonshire and Denbigshire, rises in SE Carnarvonshire and flows generally N to the Irish Sea at Conway. The river has

a total length of about 30 miles and is famous for its scenic beauty.

CONWELL, RUSSELL HERMAN, 1843–1925, U.S. clergyman, educator, and lecturer, was born in South Worthington, Mass. After serving with the Union army in the Civil War, he practiced law, 1865–79, and became a Baptist clergyman, 1881. Conwell founded Temple University in Philadelphia, 1888, and was its first president. A lecturer for more than 60 years, he delivered his famous *Acres of Diamonds* more than 6000 times.

CONY, or pika, is a small rabbit-like animal belonging to the family *Ochotonidae*. The animal is found in rocky regions of Asia and Europe and in the United States west of the Rocky Mountains. The mature cony is about 6 inches long, and except for its lack of tail and shorter ears and hind legs it looks like a tiny rabbit. Conies spend the summertime gathering green vegetation which is dried in the sun and stored in their dens. The hay thus made is used for food during the winter. Each cony litter has three or four young, but conies are not as prolific as rabbits and hares. The name cony was once applied to any rabbit fur, and it is also a common name for the hyrax. See HYRAX.

COO. See COS.

COOCH BEHAR, former princely state in the Eastern States agency, located in what is now northeast West Bengal State, India. The kingdom of Cooch Behar was founded early in the sixteenth century. In 1661, the capital of Cooch Behar was captured by the Mogul emperor Aurangzeb and annexed to the Mogul empire. Later the kingdom was recovered by its raja but soon the southern and eastern portions were annexed by the Moguls. Late in the eighteenth century, the area was overrun by the Bhutanese, and the ruler asked the assistance of the East India Company. In the treaty that followed, the maharaja acknowledged subjection to the British East India Company. Cooch Behar joined the republic of India in 1950.

COOK, FREDERICK ALBERT, 1856–1940, U.S. physician and explorer, was born in Callicoon Depot, N.Y., and was graduated from the New York University Medical School in 1890. He was surgeon of the Peary Arctic expedition, 1891–92, and the Belgian Antarctic expedition, 1897–99. In 1909 Cook's claim that he had reached the North Pole in April 1908 started a sensational controversy. Because of insufficient evidence his claim was rejected by scientists at the University of Copenhagen. Imprisoned in 1925 for his part in an oil field swindle, Cook was paroled in 1930 and pardoned in 1940. His books include *Through the First Antarctic Night* (1900), *To the Top of the Continent* (1908), and *My Attainment of the Pole* (1909).

COOK, JAMES, 1728–79, English naval officer and explorer, was born in Marton, Yorkshire. The self-taught son of a farm laborer, in 1755 he enlisted in the British navy at the outbreak of war with the French, became master of the *Mercury* in 1759, and took soundings in the St. Lawrence River in the face of French guns. Cook also surveyed the coast of Newfoundland and Labrador, 1763–67. Commissioned a lieutenant and put in command of the *Endeavour*, 1768, Cook sailed for Tahiti, touching at Madeira, Rio de Janeiro, and Tierra del Fuego along the way. After observing the transit of Venus at Tahiti, 1769, he surveyed the coast of New Zealand and the east coast of Australia. He returned to England in 1771, having circumnavigated the globe.

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James Cook

On a second expedition to the South Pacific, 1772–75, with the ships *Resolution* and *Adventure*, Cook sailed farther south than any mariner before him. Many geographers of the time asserted that a vast continent, "Terra Australis Incognita," existed in the Southern Hemisphere serving to "balance" the vast land areas of the Northern Hemisphere. Cook demonstrated that "Terra Australis Incognita" did not in fact exist. He explored the Antarctic Ocean and the New Hebrides; and discovered New Caledonia, New Georgia, and the Solomon and Loyalty islands. Returning to England, Cook was awarded the Copley gold medal by the Royal Society for having prevented scurvy and fever among members of the expedition. Their food had sometimes included vulture, albatross, dog, and kangaroo as variations from the standard shipboard fare of salt pork, tainted beef, and weevil-laden biscuits.

Promoted to captain in 1776, Cook sailed with the *Resolution* and the *Discovery* to search for a waterway across North America. After rediscovering in 1778 the Sandwich (Hawaiian) Islands, which he had sighted on a previous voyage, Cook charted the Pacific Coast of North America as far north as Bering Strait. Later in the year he returned to the island of Hawaii, one of the group he had named for his friend and patron, Lord Sandwich, and was killed there on Feb. 14, 1779, during a skirmish with the natives. Cook told the story of his first voyage in Volumes II and III of John Hawkesworth's *Voyages* (1773); the official account of the second voyage was published in 1777, and that of the third in 1784.

COOK, THOMAS, 1808–92, English tourist agent and founder of Thomas Cook and Son, was born in Melbourne, Derbyshire. He opened a travel agency in 1841, organized a circle tour of Europe, 1856, and tours to the United States, 1866. In 1884 Cook arranged the transportation of 18,000 troops to the Sudan to relieve Gen. Charles George Gordon. John Mason Cook, 1834–99, his father's partner after 1864, extended the firm's services to the United States, Canada, and the Continent.

COOK, MOUNT, Maori Aorangi, the highest mountain in New Zealand, on South Island, in the central Southern Alps, 30 miles W of Christchurch. Mount Cook (12,349 ft.) is permanently capped with snow and is located in Tasman National Park. It was first climbed in the late nineteenth century.

COOKE, JAY, 1821–1905, U.S. banker and financier, was born in what is now Sandusky, Ohio. In 1839 he joined the banking house of E. W. Clark, Philadelphia, and in 1861 formed Jay Cooke and Company, later one of the nation's leading banking houses. During the Civil War Cooke successfully handled various war loans and was fiscal agent for the Treasury Department. Expanding his company, he invested heavily in the Northern Pacific Railroad. Overspeculation caused his firm to fail in 1873, a move which aided in starting a financial panic. However, Cooke was able to recover from his losses and partially repay his creditors through investments in western mines.

COOKE, JOHN ESTEN, 1830–86, U.S. soldier and writer, was born in Winchester, Va., and was a brother of the poet Philip Pendleton Cooke. After unsuccessfully studying law in his father's Richmond, Va., office, he turned to writing poems, essays, and fiction. A well known author by the time of the Civil War, he served with the Confederacy, rising to the rank of major, and became one of its first historians. Returning to the Valley of Virginia after the war, Cooke resumed his writing career. He was a prolific author and his books were entertaining enough—but he unduly idealized life in Virginia. His historical writings include *Life of Stonewall Jackson* (1863), *Wearing of the Gray* (1867) and *A Life of Robert E. Lee* (1871). His most widely known romance was *My Lady Pokahontas* (1885).

COOKE, ROSE TERRY, 1827–92, U.S. regional writer and poet, was born in West Hartford, Conn. Her best works are sketches of New England rural life, such as *Huckleberries Gathered from New England Hills* (1891). Earlier collections were published in 1860 and 1888.

COOKERY is the art of preparing palatable and nourishing food. One of the earliest accomplishments of man, cookery has had a long history, intimately associated in different times and lands with the food and fuel materials regionally available, with changes in fashion, and with advances in knowledge of food chemistry and the needs of the human organism. The object of modern cookery is to destroy harmful bacteria and to make food more readily digestible, tastier, and more attractive, without destroying its most nutritive elements.

Past and Present

Primitive Techniques. The use of fire for cookery of food began at the dawn of human culture. In the childhood of the human race man hunted and fished and gathered nuts and berries. Early archaeological artifacts disclose the different kinds of wild animals man brought home from the hunt, and the fossil remains in caves indicate the use of fire to roast some of the meat before it was eaten. It is well to recognize our debt to primitive man, for most of the foods we eat and most of the methods we use in the cookery of our foods had their origins in his contributions. See Anthropology.

Gradually, man shifted from being a collector to gardening and herding. Giving up nomadic wanderings in favor of cultivation of a plot of land meant, for woman, the use of a permanent fireplace and a place for the storage of food. A succession of cookery techniques were discovered. Early man learned to broil meat by suspending it over the fire. Another early method—the use of the hot, flat stones as a griddle—was first employed in the cooking of meat and later in baking simple flat cakes of meal and water. The first oven was made by lining a hole or pit with stones and then building a roaring fire in it. When the fire had burned down to coals and the lining stones were piping hot, the meat was put in the pit and the top was covered with leaves, earth, or more hot stones; thus the food within the pit slowly cooked. Gradually ovens were built of stone above the ground. The use of hot stones also made possible the first boiling or stewing methods. Pits were lined with hide or bladder and filled with water that was brought to the boiling point by carefully adding hot stones. The food was then dropped into these boiling pots and allowed to simmer until done. With the advent of metals came the bail-handled kettle, supported by tripod and crane; with this the last basic method of cookery was developed.

Early American Cookery. The pioneer housewife in the colonies, and later United States, did her cooking at the hearth. A few pieces of simple iron equipment sufficed: a kettle with a tight lid (one type was called the bake-kettle), a skillet or spider, a gridiron, and perhaps a reflector. Early American cookery could not be described as sophisticated, but it was delicious and interesting in its rugged simplicity. The story of the Indian Squanto saving the band of Pilgrims from starvation by showing them how to plant maize and cook the harvested grain in many different ways is well known. It also indicates the contributions of the American Indian to foods of today: maize, tomatoes, squash, potatoes, pumpkins, beans, wild rice, turkeys, nuts, and melons and many other fruits. Immigrants from various areas brought with them the rich heritage of the cookery of the Old World. They clung to their regional and national dishes but at the same time welcomed the use of New World foods. Intermingling of the different groups resulted in dissemination of their food habits. See Food.

Modern Methods. The environment of cookery has undergone extensive changes which are reflected chiefly in the kitchen. The preparation and packaging of much of the family's food is now the business of extensive food-processing industries. There is a wide range of partially or fully reparped, packaged, and frozen foods available in markets. A can of stew or soup chosen from the dehydrated, canned, or frozen assortments takes only a few minutes of preparation time, whereas formerly the multiple processes performed in home kitchens to obtain the same result often extended over hours and necessitated considerable labor. See Canning; Food Processing; Frozen Food.

Flesh, Fish, and Fowl

Through the ages meats have held a prominent place in man's daily food. There are such marked similarities in the protein composition of meat, sea foods, and poultry that the basic principles which are given for meats generally apply equally to fish and fowl. (See Fish; Meat; Poultry and Poultry Farming.) Modern refrigeration has meant the availability of fresh meats during all seasons of the year. For short-time storage in the home, fresh meat should be loosely covered and placed in the coldest part of the refrigerator. Because curing of the smoked and cured meats is relatively mild they also should be refrigerated. Meat to be held in frozen storage should be carefully wrapped in vapor-proof, moisture-proof paper and stored at 0°F or below. See Refrigeration.

Successful preparation of meat for the meal centers around two basic concepts: selection of the appropriate method of cookery for the specific cut of meat, and adherence to the basic rule that all meats should be cooked at relatively low temperatures. Two general methods of meat cookery are the use of *dry heat*, and the use of *moist heat*. Dry heat involves roasting, broiling, and frying; moist heat, braising and cooking-in-liquid. The most accurate guide for determining doneness in the dry-heat cooking is the use of a meat thermometer. Timetables are helpful guides in time management plans, but it should be remembered that they are approximations.

Roasting. This is the cooking of meat in an oven in a shallow uncovered pan, with the heat reflected to the meat from the walls of the oven. A knowledge of probable time ratios needed to roast beef to differing stages of doneness is helpful in estimating time needs. Approximately 20 minutes per pound is needed to roast meat to the rare stage, 25 minutes per pound to the medium stage, and 30 minutes per pound to be well done. After the roast is "cooked," an extra 20 to 25 minutes should be added to permit it to "set" and thus make carving easy. To *barbecue* is to roast slowly, often on a spit or over coals, and usually accompanied by basting with a sharply seasoned sauce.

Broiling. In broiling, meat is exposed to direct heat to be cooked by radiant heat, or it is cooked on an uncovered pan or griddle. The latter is termed *pan broiling*. Cuts appropriate for broiling, like those suitable for roasting, are tender cuts or portions that have been tenderized; usually these cuts are smaller or thinner than a roast and cook in less total time. Broiling temperatures of 350°F are recommended for thick steaks; for thin cuts, a slightly higher temperature may be used to avoid drying. It is well to adjust the distance of the broiler-rack from the flame so that thick steaks (1½ to 2 inches in thickness) are 3 inches from the flame and the thinner steaks (less than 1½ inches in thickness) approximately two inches. Beef steaks, like roasts, will be more juicy, more flavorful, serve more persons to the pound, and make more attractive servings if cooked rare or medium-rare than if cooked to the well-done stage. Pan broiling is the best method if the steaks are thin. The pan or griddle should be greased with just enough fat to form a thin film to keep the meat from

UN

WESTINGHOUSE ELECTRIC CORP.

Methods of food preparation vary widely. A woman of the Terai region of northern India, left, prepares for a meal using a mortar and pestle to blend the flour and water for chapatty, a thin unleavened griddle cake. An American housewife, right, uses a modern electric mixer to blend the ingredients of a recipe; lightweight and portable, it saves her time and energy.

sticking. The meat should be turned occasionally for uniform cooking and accumulated fat should be removed. The meat should be seasoned sparingly and served immediately.

Frying. In frying the heat is transferred to the meat by the fat. When the meat is immersed in hot fat for a sufficient cooking time, it is called *deep-fat frying;* when a small amount of fat is used, the method is termed *frying* or *pan frying*, or *sautéing*. The container is not covered and moderate temperatures should be employed. The use of a thermometer in deep-fat frying is an invaluable guide. Usually temperatures of 300°F are used to cook raw meats, but the fat may be heated to 350°F for the frying of precooked meats.

Braising is cooking meat in a moist atmosphere. This requires the use of a heavy container with a tight-fitting lid; small amounts of liquid may be added for certain cuts or for certain kinds of products. With some pot roasts the meat may be carefully braised in its own juices, without added moisture. For most preparations the meat is first carefully browned in a small amount of fat (sautéed) and then tightly covered to cook in steam, which is the braising process. When the meat is cut up in small portions it is termed a *fricassee*. A low temperature should be maintained and the braising may be done on top of the range or in the oven (300°F to 325°F).

Cooking in Liquid. The less tender cuts and certain cured cuts are best cooked by immersing them in water kept within the simmering range. When large cuts, such as of ham and corned beef, are cooked by simmering they should be cooled in the cooking liquid if they are to be served cold. When small pieces of meat are simmered the product is a *stew*. Usually the pieces of meat are browned by sautéing and vegetables are added. Meats cooked by moist heat are cooked to the well-done stage, which is determined by the ease with which the fibers separate.

Milk and Cheese

Milk and cheese are of special importance in the diet because of their signal nutritive contributions. Milk contains many nutrients in proportions well balanced for utilization by the human body, but it is even more valuable because of its calcium, riboflavin, and protein. Highly perishable, it should be kept clean, cold, and covered. Drinking milk as a plain beverage is the simplest and best way to insure that the proper amount is included in the diet (see Milk). In cookery, milk should be heated in a double boiler. There are numerous hot and cold beverages which may be made using milk as the base and adding a dash of flavoring. Other uses which should be emphasized include cooking cereals in milk, cream soups, cream sauces, escalloped dishes, custards, puddings, ice creams, and sherbets. When milk is used in cooking, the cardinal rule is to use low or moderate temperatures.

Cheeses are extremely versatile and distinctive in their contributions to the menu. For use in cookery, a well-ripened cheddar is usually preferred. As the fat content of the cheese melts with heating, the total structure of the cheese softens. As with milk, low to moderate heating temperatures should always be used. In combining cheese with other foods, it should be protected from the heat by the other ingredients. A wide variety of cheeses find special roles in salads, snacks and hors d'oeuvres, and with fruits for dessert. When cheese is used in these ways without heating it should be taken out of the refrigerator at least an hour before serving, so that the delicate flavors may be savored to the full. See Cheese.

Eggs

Eggs are valuable in the diet because they contain vital high-quality nutrients and can be used in a diversity of culinary products (see Egg). Because eggs are readily perishable, maintenance of good quality eggs depends on storing them at refrigeration temperatures. Soft-cooked egg products should also be refrigerated if they are to be held over a period of time. For reasons of sanitation, the shells of eggs should always be washed before the eggs are used or broken from the shell. The value of eggs in cookery comes primarily from their protein content. The protein of egg coagulates upon heating or by whipping or beating. Eggs should not be

hard boiled or subjected to high temperatures; excessive heat toughens protein. Eggs may, however, be cooked in the shell at simmering temperatures; when the cooking time is limited to a few minutes they are *soft cooked*, if the cooking time is 15 or 20 minutes longer, they will be *hard cooked*. Eggs may also be fried in a small amount of fat, as in the pan frying of meat. They are *poached* by breaking them from the shell into water at temperatures just below the boiling point; the water should completely cover the eggs and the pan should be covered to retain the heat. In *scrambled eggs* and *French omelets*, each egg should be diluted with 1 to 2 tablespoons of liquid. The difference between the two products is that the mixture for scrambled eggs is gently rolled into soft masses as it coagulates; the French omelet thickens in one soft, fluffy mass and is folded into a half-circle for serving.

Eggs can also serve as binding or coating agents in holding small pieces of food together, as in the making of croquettes. This same role is exemplified in using eggs to help a coating adhere to a product, such as in the "breading" process. Excellent emulsifying agents, eggs are essential ingredients in many types of salad dressings (see Emulsion). Their emulsification properties are used in other products where the fat or oil distribution is facilitated by the emulsification of the egg. The gel structure of *custards*, both soft (stirred) and baked, illustrates the thickening capacity of eggs. Custards and custard variations are very easily made, but time and temperature must be controlled. In many related products, such as puddings or cream-pie fillings, the egg contributes to the thickening of the product. Because eggs can be whipped into foam, they contribute to the leavening and to the structure of many products. *Foamy omelets*, *soufflé*, *meringue*, *sponge cake*, and *angel cake* have light, fluffy porous structures because the eggs are beaten into foam. In most batter and dough products, eggs augment the primary structural elements; if the egg is incorporated in these products as a stable foam it may also aid in the leavening of the product.

Cereal Grains

The most important cereal grains are wheat, corn, rice, oats, barley, and rye (see Cereal). The whole grains have good keeping qualities; this is one reason why they have been a staple in the diet of every society. Our ancestors used much more grain in their diet than we do and, because of crude milling methods, they used more of the entire kernel. Various techniques of subdividing the grain have been devised because it takes time for water to penetrate the resistant outer layers of bran. The grain may be cracked, as in cracked wheat; cutting through the kernel in several places, as in steel-cut oats, is another technique. The entire seed can be ground to varying degrees of fineness, as for whole-wheat flour or water-ground cornmeal. The use of the entire grain means that all of the grain nutrients are added to the diet.

The cookery of the grains and their products is essentially the insuring of complete gelatinization of the starch portion (see Colloid). When considerable bran is present to delay or interfere with adequate hydration of the starch, more time must be allowed for the slower permeation of the water; the use of a double boiler is an invaluable aid. This type of cookery does not require continuous supervision by the homemaker, but advance planning and time management are needed. The grains or portions of the grains are used in many products: breakfast cereal or porridge, molded loaves which are sliced and browned in fat, casseroles, various kinds of breads, and hearty desserts. Technological improvements have resulted in extensive fractionation of the grains, and many more fractionated products are used than are the whole grains. Many products are made up largely of the endosperm or starchy portion of the grains. Some of these products bear little resemblance to the flavorful whole grain products on which our forefathers depended.

The cookery of cereal, for porridge or for use in some other product, is based on a few essential principles. The particles of cereal should be separated when combining them with boiling water; the ratio of water to starch must be balanced so as to afford complete gelatinization of starch, and the optimum amount of heating should insure gelatinization and elimination of the raw starch flavor. Care must be taken that the product is not overstirred. Too many cereals suffer from being overstirred and undercooked. The number of partially cooked or ready-to-serve cereals has grown beyond count; these products are timesavers, but soon impart a dullness and a monotony to meals.

Fruits and Vegetables

Fruits and vegetables are essential to the diet, providing needed minerals, vitamins, and other dietary essentials. They are also indispensable because of the interest and appeal they add in the way of color, contour, textures, flavors, and aroma. In no other food group do we have the variety and flamboyancy of color, the wide range of textures and flavors that are derived from vegetables and fruits.

In cooking vegetables the aim is to minimize losses by solution and by inactivation. The degree of doneness—how much the vegetable is cooked—is of paramount consideration. Starchy vegetables such as potatoes, turnips, and squash should be cooked to insure optimal gelatinization of the starch and maximum dissipation of water; the resultant product will then be fluffy and mealy. With other vegetables the aim is not for complete tenderness, which would result in mushiness, but rather the retention of a certain amount of structural crispness balanced with optimal tenderness. The aim is to be able to cut the served vegetable with a fork but to avoid creating a mass that has lost all semblance of its original form. Vegetables often fail to excite the eye and the palate because they are commonly overcooked, cooked in too much water, or cooked by the same method day after day.

General Procedures. Vegetables may be cooked the same as meat by dry or moist heat. Certain vegetables may be baked whole in their skins. Others may be cut in portions and fried: when the pieces are fried in deep fat, they are *French-fried*, but when shredded and cooked in a small amount of fat in a covered pan the process is called *panning*. Vegetables may also be steamed whole or in sections, or boiled. After boiling they are often mashed, or riced, or browned in hot fat, or they may be cubed and used cold in salads. When vegetables are boiled, they are always put into boiling water, using as little water as possible to effect the desired tenderness.

Special Problems. The cookery of the sulfur-containing vegetables presents special problems. In the onion family the sulfur compounds are volatile and soluble with heat and solution; it is therefore recommended that onions be cooked in a large amount of water in an uncovered container. The members of the mustard and cabbage groups contain mustard oil, which is sharp and pungent in the raw state but is not objectionable. With the heat of long cookery, mustard oil is decomposed into substances that are strong and disagreeable. Vegetables in this group include cabbage, Brussels sprouts, broccoli, turnips, and cauliflower. These vegetables should be cooked in a large amount of boiling water in an uncovered utensil for as short a time as possible. Green spring cabbage is an exception to this rule; it may be shredded finely and cooked in a small amount of boiling water in a tightly-covered pan for 3 to 5 minutes.

Preparing Fruits. Many fruits are enjoyed in the raw state, but also have wide cookery possibilities.

In cooking fruits minimum amounts of sugar and minimum heating times should be used so that the distinctive aromatic flavoring substances may be retained. Many fruits may be cooked by methods similar to those for vegetables. Certain fruits may be baked, broiled, sautéed, or boiled; if they are boiled, mashed, and sieved, the product is often termed *purée*.

Frozen fruits and vegetables, vast assortments of which are available in the markets at all seasons of the year, greatly reduce the time element in preparation and cooking. They are packaged for convenient storage in large quantities in home freezers.

Herbs and Spices

By using the variety of greens available and a lively imagination in selecting and combining other foods, a myriad of tasty salads can be made. Preparation and care of the greens, whether they provide only the setting for other ingredients or make up the salad proper, need special attention. Good quality, clean, crisp, and succulent leaves or stalks should be used. After the salad plants have been thoroughly washed, it is best to refrigerate them in a moisture-proof bag for several hours. Before they are used the greens should be carefully blotted by tossing them in absorbent toweling so that the salad will not be watery. For certain salads it may be desirable to marinate potatoes, meat, or fish in French dressing or vinegar before using them in the salad which will be garnished with another thicker dressing. There are three primary types of salad dressings: French, cooked, and mayonnaise. The combinations and variations that can be made are legion. The dressing should always enhance the other ingredients in a salad. For crisp green salads many people prefer just a sprinkling of vinegar or a dash of lemon. The individual leafy flavors and textures are retained better in this way than when drenched with oil. The use of herbs and spices offers a challenge to culinary artistry. Just a dash or a suggestion represents real artistry in their use. Herbs and spices should always heighten and flatter the natural flavors of the food itself, and should never be overpowering. See Herb; Spice; Baking; Diet; Nutrition; Vitamin.

Madge Miller

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COOKEVILLE, town, central Tennessee, county seat of Putnam County, on the Tennessee Central Railroad, and on U.S. Highway 70N; 70 miles E of Nashville. Cookeville is situated in an agricultural, lumbering, and coal mining area. Manufactures include shoes, shirts, sporting goods, and lumber products. It is the site of Tennessee Polytechnic Institute. The city has a commission form of government. Pop. (1950) 6924.

COOK INLET, an inlet of the Gulf of Alaska, S Alaska; lies between Kenai Peninsula on the E and the Alaskan mainland on the W. It extends about 200 miles southwest from the port of Anchorage and is 9 to 80 miles wide. The upper part of the inlet is closed by ice from November to May.

COOK ISLANDS, island group of Polynesia in the S Pacific Ocean, under the administration of New Zealand, about 2000 miles NE of Auckland, New Zealand; area 90 sq. mi.; pop. (1954) 15,657. The Cook Islands consist of two mountainous major islands of volcanic origin, Rarotonga and Mangaia, together with several low coral atolls. The larger coral islands of the group are Aitutaki, Atiu, Manuae, Mauke, Mitiaro, and Takutea. Some of the smaller Cook Islands are uninhabited or have only a few inhabitants. The Polynesian islanders practice subsistence agriculture and fishing. There are some exports of copra, citrus fruits, mother-of-pearl, vegetables, and lumber. Rarotonga is the most populous island; Avarua, on the north coast, is the seat of government and main port of the Cook Islands. Air fields are located on Rarotonga and Aitutaki. Included within Cook Islands for the purposes of administration are the islands some 600 miles to the northeast, among them Manihiki, Tongareva (Penrhyn), Rakahanga, and Pukapuka (Danger). Capt. James Cook in 1773 discovered some of the Cook Islands which he named the Hervey Islands. During the early nineteenth century mission stations were established and the inhabitants largely converted to Christianity. During this period the islands were effectively administered by the missionaries and in 1888 were formally placed under British protection. In 1901 the Cook Islands were annexed to New Zealand. The New Zealand resident commissioner at Avarua, Rarotonga, is assisted in administration of the islands as a whole by a legislative council. Local legislation is effected by individual island councils.

COOK STRAIT, central New Zealand, separating North Island and South Island. The strait is only about 15 miles wide in the narrow central section. It was discovered by Capt. James Cook in 1770.

COOLBRITH, INA DONNA, 1842–1928, U.S. poet, was born near Springfield, Ill. She was associated with Bret Harte on the *Overland Monthly*, 1868, became a librarian, and was poet laureate of California, 1915.

COOLEY, CHARLES HORTON, 1864–1929, U.S. sociologist, was born in Ann Arbor, Mich., and was educated at the University of Michigan, where he spent most of his life teaching, studying, and writing in sociology. In 1918 he was president of the American Sociological Society. Cooley was more concerned with questions than with answers; he would outline a problem, present points of view, suggest leads, and let others come to a practical conclusion. His theory of social relations stated simply that life is a single whole, must be seen as such if it is to be understood, and must be kept as such if it is to survive. He maintained that the individual and society are inseparable complements to one another, constantly remaking each other in an endless process of institutional change. Cooley wrote *Social Organization* (1909), *Social Process* (1918), and *Sociological Theory and Social Research* (1930).

COOLEY, THOMAS McINTYRE, 1824–98, U.S. jurist, was born near Attica, N.Y. He was professor of law at the University of Michigan, 1859–84, judge of the Michigan supreme court, 1864–85, and was the first chairman of the Interstate Commerce Commission, 1887–91. Cooley was famous as a writer on legal subjects and as an interpreter of the Constitution. His works include *Constitutional Limitations of the States of the American Union* (1873) and treatises on taxation, torts, and constitutional law.

COOLGARDIE, town, SW Australia, in the state of Western Australia, 340 miles ENE of Perth. Coolgardie is in a gold-mining region with its center at nearby Kalgoorlie. Gold has been mined at Coolgardie since its discovery in 1892. Pop. (1954) 1540.

COOLIDGE, ARCHIBALD CARY, 1866–1928, U.S. historian, was born in Boston, Mass. Coolidge was educated at Harvard University and in Freiburg, Germany. Later he was secretary to his uncle, Thomas J. Coolidge, U.S. minister to France, 1892, and after 1893 taught history at Harvard University. Editor of *Foreign Affairs*, 1922–27, he wrote *The United States as a World Power* (1908) and *Ten Years of War and Peace* (1927).

It happened when Calvin Coolidge was president

"All the News That's Fit to Print."

The New York Times.

THE WEATHER

Section 1

NEW YORK, SUNDAY, MAY 22, 1927. FIVE CENTS

NDBERGH DOES IT! TO PARIS IN 33½ HOURS; LIES 1,000 MILES THROUGH SNOW AND SLEET; CHEERING FRENCH CARRY HIM OFF FIELD

HAVE GONE 600 MILES FARTHER

o for at Least That Much More at Times From 10 Feet to 0,000 Feet Above Water.

ONE AND A HALF OF HIS FIVE SANDWICHES

at Times but Quickly Awake—Glimpses His Adventure in Brief Interview at the Embassy.

ERGH'S OWN STORY TOMORROW

MAP OF LINDBERGH'S TRANSATLANTIC ROUTE, SHOWING THE SPEED OF HIS TRIP

LEVINE ABANDONS BELLANCA FLIGHT

Yonkers Grain Dlr. to Designer Splits With Him—Plane Nar rowly Escapes Surging.

BYRD'S CRAFT IS GAINED

Lindbergh Cheered at Dinner—Commander Now Last in Field, Wylie on Weather.

CAPTAIN CHARLES A. LINDBERGH, Who Flew Alone Across the Atlantic From New York to Paris.

LINDBERGH TRIUMPH THRILLS COOLIDGE

President Cables Praise to "Heroic Flier" and Concern for Bungesser and Coli.

CAPITAL THRONS WITH JOY

Kellogg Hint, MacMaster Patrick and Many More Join in Paying Tribute to Daring Youth.

New York Stages Big Celebration After Hours of Anxious Waiting

Harbor Craft, Factories, Fire Sirens and Radio Carry Message of the Flier's Victory Throughout the City—Tiantless Rah While Audiences Cheer

CROWD ROARS THUNDEROUS WELCOME

Breaks Through Lines of Soldiers and Police and Surging to Plane Lifts Weary Flier from His Cockpit

AWAITING MESSAGE LONG TERM PARCELPOST MAIN OF 25,000

Paris Boulevards Ring With Celebration After Day and Night Watch—American Flag Is Called For and Wildly Acclaimed

By EDWIN L. JAMES

PARIS, May 21.—Lindbergh did it. Twenty thirteen after 10 o'clock (10:13) suddenly and softly there slipped out of the darkness a gray white airplane at 25,000 pairs of eyes strained toward it. At 10:24 the Spirit of St. Louis landed and tens of millions, racks of policemen and silent staff forces were down before a mad rush so irresistible as the tides of the ocean.

Well, I made it," greeted Lindbergh as the little white monoplane came to a halt in the middle of the field and the first telegram reached the plane. Lindbergh made a move to jump out. Twenty hands reached for him and lifted him out as if he were a child. Then Lindbergh made a wonder wave around the plane. Then his eyes broke the barriers of iron rails round the field, showing wildly.

Lifted From His Cockpit.

As he was lifted to the ground Lindbergh was pale and, with his face unshaved, he looked considerably worn and. He had been in the cockpit for 33 hours and 30 minutes of the world's record. Soldiers with their harnesses were unable to have been crowded.

United States Ambassador Herrick was among the first to welcome and congratulate the hero.

New York Times was one of the first to reach the machine after its graceful descent to the field. Those first to arrive at the plane had a picture that will live in their records for the rest of their lives. He was off his famous helm letting in dancing a round for him. "Lucky Lindy" and passing not ever over the rim of the iron cockpit of his machine.

Dramatic Scene at the Field.

It was high drama. Picture the scene. Twenty to twenty-five thousand people were massed on the vast side of Le Bourget air field. Scores of them had been there six and seven hours. Off to the left the great plane exhibition of Marcel Dassault is standing light for the night. Over the field are the eight searcher giant revolving the beacons.

Big are lights on all sides ... trees, flanking the landing field, and here in varied lights on farms likely the best known and gone. Then it's start's make a the sea had set but then came the word that Lindbergh had left Long Island and there were 7½ hours to.

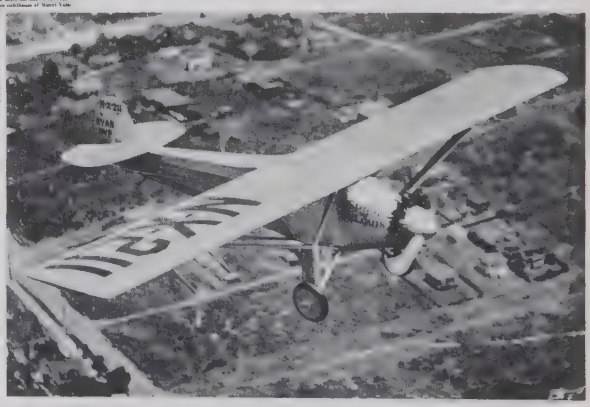
Suddenly a message spread ... news over Charlbourg. Darkness lifting of Captain Nungle completed.

"One chance in a thousand."

Charles A. Lindbergh made the first nonstop flight from New York to Paris, flying his *Spirit of St. Louis*, alone on the 3600 mile trip, to land at Le Bourget airfield, Paris, 33½ hours after take-off.

EWING GALLOWAY

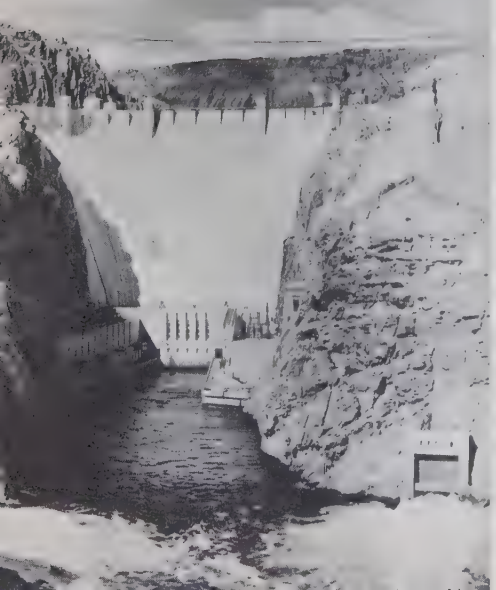
Brisk trading on the stock exchanges was in strong contrast to the severe farm problems.



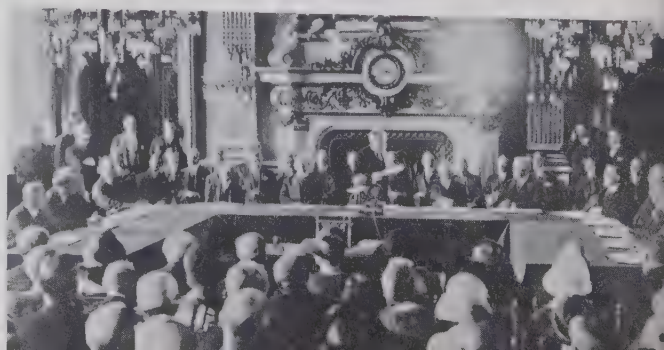
INTERNATIONAL NEWS

The Hoover Dam project for flood control of the Colorado was authorized.

BUREAU OF RECLAMATION



The Kellogg-Briand Pact, signed in 1928 in Paris, gave promise for world peace.



Birthplace: Plymouth, Vt.

CALVIN COOLIDGE

30th President of the United States

1923—1929

COOLIDGE, CALVIN, full name John Calvin Coolidge, 1872–1933, 30th President of the United States, was born and reared in the hamlet of Plymouth, Vt., where his father John Coolidge ran a small farm and general store. His mother, Victoria Josephine Moor, died when the boy was 12, and he was raised thereafter by a stepmother. Young Calvin worked hard at dairying, haying, and storekeeping, and learned the traits of the frugal, puritanical community: thrift, enterprise, taciturnity, precision, and piety. In 1886 he entered an academy at Ludlow with a sense of escaping from narrow drudgery, and in 1891 went on to Amherst College. He was remembered there as a quiet, reflective lad with a touch of whimsical humor. As a student he took keen interest in the presidential campaigns of 1888 and 1892, read and was inspired by the writings of Alexander Hamilton, and practiced public speaking.

By the time he had begun the study of law with attorneys in Northampton, Mass., Coolidge had already acquired political ambitions. His slow, steady rise at the Northampton bar was paralleled by a step-by-step climb from city councilman and mayor to the Massachusetts house, senate, and governorship. His political creed was unswervingly Republican, immutably conservative, and stubbornly cautious. The state, he said, needed "more of the office desk and less of the show window"; and it was "more important to kill bad bills than to pass good ones." He shunned publicity, worked long hours, kept what few promises he made, and so impressed the public with his integrity and earnestness that he gained a considerable following among sober Democrats. He read widely and later boasted that "I studied subjects sufficiently to know a little more about them" than other public men. In 1919, during his governorship, the underpaid, overworked Boston police formed a union and went on strike. Coolidge hesitated for three days until violence dramatized the situation, and then suddenly called out the state guard with the defiant declaration: "There is no right to strike against the public safety by anybody, anywhere, any time." Seventy thousand letters and telegrams and the congratulations of President Wilson showed that Coolidge had caught the nation's imagination.

As Vice-President. Although the bosses at the 1920 Republican national convention had already decided on another man, Coolidge's popularity was great enough to win him the vice-presidential nomination. Once elected, he profited in 1921–23 from the contrast between his simplicity, reticence, and caution, and President Warren Harding's expansive blundering. In August 1923, while vacationing at Plymouth, the vice-president was awakened by word that Harding had died. Praying, he descended to the plain living room, lighted by two kerosene lamps, and took the oath of office from his father—an incident that soon became part of the national folklore. At once he took charge of Republican destinies, imperiled by the scandals Harding had left behind. He gladly accepted the resignations of two vulnerable Cabinet members, Secretary of the Navy Edwin Denby and Attorney General Harry Daugherty; won over the conservative wing of the party by endorsing Secretary Andrew Mellon's tax program and vetoing a veterans' bonus bill; and settled down in the White House.

As President. National prosperity and inertia made Coolidge's do-as-little-as-possible policy so popular that in the three-cornered election of 1924 Coolidge had no difficulty in defeating John W. Davis and Robert M. LaFollette. His record during the next four years was one of the most colorless in American history. Business was in the saddle, and Coolidge shared its desire for governmental economy, high tariffs, cumulative tax reductions, and a general laissez-faire attitude. The kind of "policing" of business for which Theodore Roosevelt and Woodrow Wilson had stood was forgotten. In such matters as the Muscle Shoals water power Coolidge opposed government activity. Despite his own rural background he evidenced no sympathy for the suffering farmers, whose growing poverty generated an explosive demand for relief. It was not government's business, said Coolidge, to fix farm prices or buy farm surpluses; the farmer must stand or fall on "an independent business basis." Twice Coolidge vetoed the so-called McNary-Haugen bill for federal intervention to save agriculture. When the business boom generated the wildly speculative "bull market" in stock exchange securities in 1927–28, Coolidge issued statements encouraging this dangerous phenomenon.

In foreign affairs, similarly, Coolidge took a negative attitude. As Elihu Root remarked, "he did not have an international hair in his head." Isolationism was popular and Coolidge took a frigid position with respect to the League of Nations, soon relapsed into indifference to the World Court, and firmly opposed the cancellation of any part of the war debts owed by European nations to the United States. Such positive achievements in foreign affairs as these years did witness were primarily the work of Secretaries of State Charles Evans Hughes and Frank B. Kellogg, although Coolidge deserves credit for appointing Dwight Morrow to restore harmony with Mexico. Coolidge may also be credited with supporting Kellogg in drafting the Kellogg-Briand Peace Pact and fostering its ratification by the Senate.

Aftermath. With the cryptic announcement, "I do not choose to run for President in 1928," Coolidge waved aside a renomination and re-election to office that might easily have been his. At the time he had no idea that a terrible economic crash awaited the country and his party. Retiring to Northampton, he wrote an insipid *Autobiography of Calvin Coolidge* (1929); carried on for a year a syndicated series of short newspaper articles; and gave part of his leisure to various business directorships. He came to realize that the panic of 1930 and the ensuing depression owed much to his own and his administration's errors of omission. But he retained the esteem of the public for his sturdy honesty, his self-reliance, and his Yankee shrewdness.

Undeniably, Coolidge typified an age which, gone forever, had possessed certain real if limited virtues.

ALLAN NEVINS

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COOLIDGE, SUSAN. See WOOLSEY, SARAH CHAUNCEY.

COOLIDGE, WILLIAM DAVID, 1873– , U.S. physiochemist, was born in Hudson, Mass., and studied at the Massachusetts Institute of Technology and the University of Leipzig. He taught at M.I.T., 1901–05, and then joined the General Electric Company as a research physiochemist, 1905–07. He became director of the research laboratories, 1932, and was vice-president and research director, 1940–44. Coolidge's main accomplishment was an X-ray tube with pure electron discharge, 1913, which was a vast improvement over the cathode-ray tube invented by William Crookes.

COOLIDGE, town, S central Arizona, in Pinal County, near the Gila River, on the Southern Pacific Railroad; 35 miles SE of Phoenix. Coolidge is situated in an irrigated agricultural area, with cotton and alfalfa the principal crops. Casa Grande National Monument is just west of the town. Pop. (1950) 4306. See CASA GRANDE NATIONAL MONUMENT.

COOLIDGE DAM. See GILA RIVER.

COOLIE, an unskilled Chinese or Indian laborer, especially one working in a country other than his own. The name probably derives from the *Kuli* tribe in Gujarat, India, who were frequently hired as laborers.

In almost all cases, employers were attracted by the cheapness of coolie labor, while other workers resented and feared the competition. Thousands of coolies went from China to Cuba, Peru, Chile, and Hawaii in the middle of the nineteenth century, and later to British Guiana and British and Dutch Malaysia. Chinese were also employed in Australia, in the mine fields of Victoria, as early as the 1850s, and in Queensland in the 1870s. They met with considerable hostility from miners and later from maritime workers, especially when they were used as strikebreakers.

In the United States many Chinese coolies were employed in the building of the Central Pacific Railroad, and after its completion resided in California, where they aroused violent opposition. (See IMMIGRATION.) Other Chinese emigrated to British Columbia.

Indian and Chinese coolies were employed in the South African mines and in the German colonies in Africa early in the twentieth century. Kanakas and other Pacific islanders were hired to work in the sugar fields of Queensland and were often referred to as coolies. Laws forbidding contract labor, and the restriction of Oriental immigration into the United States, Canada, and Australia, virtually brought an end to coolie labor early in the twentieth century. See CONTRACT LABOR.

COOLING. See AIR CONDITIONING; EVAPORATION, *Cooling by Evaporation;* REFRIGERATION.

COOLING TOWER. See CONDENSER, *Surface Condensers.*

COOMASSIE. See KUMASI.

COONHOUND, also known as black and tan coonhound, is a short-haired dog used for hunting. It has a dense black coat and rich tan markings above the eyes, on the muzzle, and over the chest and legs. Males may be 27 inches high, the females somewhat smaller. The coonhound's head is oval-shaped, with the skull line profile almost on a parallel plane with the muzzle. The long ears are set well back and hang in graceful folds. The body is muscular and fully rounded; the tail is long and carried at right angles to the back. The feet are catlike in their compactness and have thick, strong pads. A friendly dog, eager, alert, and aggressive, the coonhound has an easy, graceful stride that gives the impression of power and agility.

HOUNDS OF TEN OAKS

Black and Tan Coonhound

COOPER, ALFRED DUFF, 1890–1954, English political leader, was born in London. Educated at Oxford, he was elected to parliament, 1924, and was secretary of state for war, 1933–37. He was first lord of the admiralty, 1937–38, but resigned in protest against Prime Minister Neville Chamberlain's appeasement policy toward Hitlerian Germany. Cooper was minister of information, 1940–41, ambassador to France, 1944–47, and was created the first Viscount Norwich of Aldwick by Queen Elizabeth in 1952. He wrote *Talleyrand* (1932), *Operation Heartbreak* (1950), and *Old Men Forget* (1953).

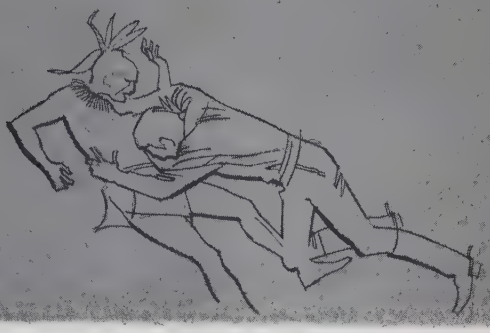
COOPER, ASHLEY. See SHAFTESBURY, ANTHONY ASHLEY COOPER.

COOPER, GARY, real name Frank James Cooper, 1901– , U.S. actor, was born in Helena, Mont. Educated at Grinnell College, Iowa, he planned to be a cartoonist, but work as a motion picture extra led to stardom after 1926. Among his better pictures are *The Virginian, A Farewell to Arms, Mr. Deeds Goes to Town, For Whom the Bell Tolls,* and *Sergeant York* and *High Noon,* for which he won Academy Awards.

COOPER, HENRY ERNEST, 1857–1929, U.S.–Hawaiian lawyer and political leader, was born in New Albany, Ind., Cooper was graduated from the Boston University law school, 1878, and practiced law in San Diego, Calif. In 1891 he went to Hawaii where he helped to overthrow the stormy rule of Queen Liliuokalani and to establish a republic. After 1893 Cooper was judge of the circuit court, foreign minister, minister of public instruction, acting president, 1898, and attorney general. After the annexation of Hawaii by the United States, Cooper was the first secretary of the territory, 1900–03, a founder of the College of Hawaii, and the first chairman of its board of regents, 1907–14.

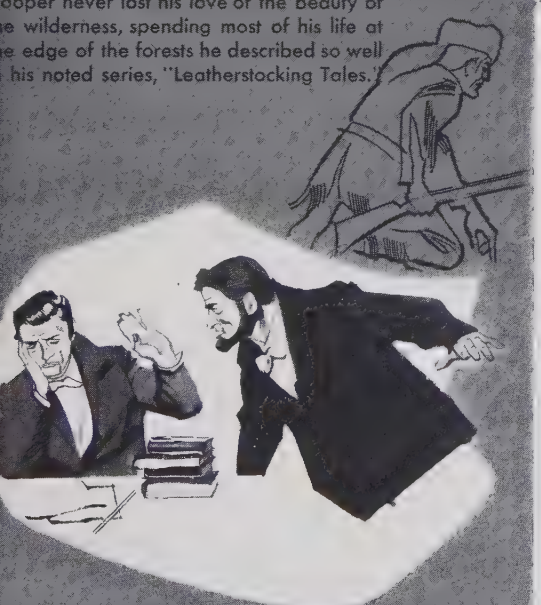
COOPER, JAMES FENIMORE, 1789–1851, U.S. author, was born in Burlington, N.J., but at an early age he was brought by his parents, Judge William Cooper and Elizabeth Fenimore, to the newly formed town of Cooperstown on the shores of Otsego Lake, N.Y. Here, in 1799, William Cooper built Otsego Hall, the most spacious and stately mansion in central New York. Significantly for the young Cooper, the new home was on the edge of the wilderness that was to be his earliest and perhaps most potent teacher. From the village school, young Cooper went into the home of the Rev. J. Ellison, from whom he received what

JAMES FENIMORE COOPER



Cooper's early life as a midshipman gave him experience that proved valuable background for the writing, in 1823, of his early novel concerning naval life, *The Pilot.*

Cooper never lost his love of the beauty of the wilderness, spending most of his life at the edge of the forests he described so well in his noted series, "Leatherstocking Tales."



Cooper, objective but tactless in his writing, disregarded the possibility of criticism that his works so often provoked. Numerous lawsuits against critics were the result.

James Fenimore Cooper as the first American novelist was lionized in Europe by people who had had no contact with the rigors of actual frontier life, but he was rejected at home where the Indian was regarded as a fierce enemy, not as a "noble savage," and the frontier forests as obstacles to be overcome, not the fabulous places of beauty described by Cooper. Yet perhaps supporters and detractors both were right. To the modern reader the Indians seem to have had admirable traits and the forests were in truth beautiful in spite of their danger to the colonists. True to life or not, the novels of Cooper are notable as the first consistent, comprehensive use of American subject matter, that gave him lasting fame in American literature.

was for the time and place an uncommonly good education. He entered Yale as a freshman in January 1803 where, by his own account, he learned little. He was undisciplined and communed more with nature than with the classroom. Expelled during his third year at the college, he returned for a time to Otsego Hall. He shortly took a berth on the merchant marine vessel *Sterling* as the surest preparation for a commission in the navy, Annapolis not yet having been established. He shipped as sailor before the mast in 1806, and the stormy 40-day voyage to London made a sailor of him. Back in Philadelphia he was commissioned midshipman in 1908, and shipped for a time on the *Vesuvius*, then was ordered to Oswego, N.Y., to build a brig for service on Lake Ontario. This was an important period for the later development of Cooper as a novelist, providing as it did a rich experience compounded of stormy voyages in the North Atlantic, a long winter on the shores of Ontario, a new view of border life, and a thorough training in the craft of naval construction. The vessel was launched in the spring of 1809 and by November of that year Cooper was assigned to the *Wasp* under Capt. James Lawrence. Sometime during the ensuing two years Cooper became engaged to a daughter of John Peter De Lancey; he was married in 1811, resigned his commission, and, after a short residence in Cooperstown, settled down in Westchester County to the cultivation of his Scarsdale estate, the Angevine Farm.

Literary Endeavors. Cooper's first work, *Precaution* (1820), published anonymously, was an unsuccessful attempt to produce a "novel of English manners." It is said to have been written on a dare from his wife. The work stimulated his literary ambitions and, deciding to deal with a theme more familiar and within his grasp, he wrote *The Spy* (1821), based upon a story told to him years before by John Jay. The book was a great success, and Americans suddenly began to be aware that in Cooper they had a novelist of their own. Cooper moved to New York City and with publication of *The Pioneers* (1823) began a series of *Leatherstocking Tales* dealing with backwoods life. *The Pilot*, also published in 1823, was one of the first sea stories by a native American. *The Last of the Mohicans* (1826) brought Cooper's popularity with the American public to its peak, whereupon he sailed with his family to Europe on a visit that was to last seven years. Throughout this period Cooper continued to produce about one novel a year. *The Prairie* (1827) and *The Red Rover* (1828) were additions to his series of novels about Indians, but *The Bravo* (1831) dealt with European themes. His opinions about his countrymen, *Notions of the Americans* (1828), reflected meetings with political leaders in Europe. By then Cooper had an international reputation, but with fame came problems. He was one of the first Americans to take an objective view of the young country and its development, but his naturally combative disposition kept him from tempering his opinions, or at the very least expressing them tactfully. As a result, in spite of his obvious patriotism, Cooper's views offended many of his countrymen.

Back in America. Upon his return to the United States in 1833, Cooper was in a disillusioned ill-humor, and in an irate pamphlet, *A Letter to His Countrymen* (1834), went so far as to resolve to abandon literature. But the pamphlet was followed by a political satire, *The Monikins* (1835); two bitterly polemical novels, *Homeward Bound* (1837) and *Home As Found* (1838); and his *History of the United States Navy* (1839), rated in later years as a well-qualified and objective work, but judged quite differently in Cooper's time. Its very impartiality infuriated both England and the United States. It was during this period that Cooper brought a series of libel suits against the newspapers that were attacking him; the suits were small but numerous, and Cooper won most of them, including that against his severest critic, Thurlow Weed. While the suits curbed the most vicious of his attackers in the press, they did nothing to increase Cooper's popularity. Perhaps the most unpleasant incident was a bitter quarrel over land with his fellow townsmen at Cooperstown, where Cooper lived after 1834.

But despite this seeming alienation from his countrymen, Cooper completed his Leatherstocking series with *The Pathfinder* (1840) and *The Deerslayer* (1841). Among his later works are the romantic trilogy, *Satanstoe* (1845), *The Chainbearer* (1845), and *The Redskins* (1846); and sea stories such as *Afloat and Ashore* (1844) and *The Sea Lions* (1849). *The Crater* (1848) was his most careful effort at social criticism. In *The Oak Openings* (1848) he again made use of the American wilderness setting. His last literary effort was a play, *Upside Down, or Philosophy in Petticoats* (1850), which ran three nights at Burton's Theater, New York, and was never played again. During his later years Cooper often wrote from financial necessity, and at his death the family was in poor circumstances. He left instructions that his private papers were to be destroyed and no biography was to be authorized.

While Cooper constantly experimented with form and content, trying to create adventure tales which would support his social and political views, his real and lasting contribution to American literature remains the romantic adventure tale. In this vein, despite minor defects of style, Cooper gave evidence of great narrative ability. If nothing else, he demonstrated that there could be a worthwhile literature devoted to native American material.

RACHEL GILBREATH

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COOPER, PETER, 1791–1883, U.S. manufacturer and philanthropist, was born in New York City. Cooper had little formal education but quickly acquired a knowledge of business. In 1813 he bought a glue factory and soon was making most of the glue sold in the United States. In 1828, with two partners, Cooper established the Canton Iron Works, Baltimore, and in 1830 was the first in the United States to build a steam locomotive, the famous "Tom Thumb." Later he built a rolling mill, a wire mill, and blast furnaces. His Trenton, N.J., plant rolled the first structural iron for fireproof buildings, 1854, and in 1856 used the first Bessemer converter, imported from England. Cooper was the chief financial backer of the Atlantic cable and was president of the North American Telegraph Company. He founded Cooper Union, chartered in New York City in 1859 "for the advancement of science and art," advocated public schools, and was the Greenback party's candidate for president in 1876. See COOPER UNION; LOCOMOTIVE.

COOPER, SAMUEL, 1798–1876, U.S. soldier, was born in Hackensack, N.J., and was graduated from West Point in 1815. In 1852 he became adjutant general with the rank of colonel, partly in recognition of his efficient work in the War Department during the Mexican War. He married a girl from Virginia and associated with such Southerners as Jefferson Davis. It came as no surprise when, despite his Northern birth, he resigned his commission at the outbreak of the Civil War. Given the rank of full general in the Confederate Army, Cooper was senior officer throughout the war, ranking all other officers; but, although he was adjutant and inspector general of the Army, he never served in the field. After the war he retired to Virginia, where he lived near Alexandria.

E. B. LONG

COOPER, THOMAS, 1759–1839, U.S. agitator, scientist, and educator, was born in Westminster,

England. After attending Oxford University he took up various vocations, including law and calico printing, and also dabbled in medicine, chemistry, philosophy, and religion. He supported the French Revolution in its beginnings but, becoming disgusted with the terrorists, went to the United States in 1794, settling in Northumberland, Pa., where he practiced law and served, unofficially, as a physician. By 1799 he had become known as an anti-Federalist pamphleteer, bitterly attacking the Alien and Sedition Acts, under which he was convicted, 1800, and sent to jail. Becoming more conservative, he left politics and a judgeship to teach science at Carlisle (later Dickinson) College, 1811–15, and the University of Pennsylvania, 1816–19. He wrote a series of scientific papers, and in 1820 joined the faculty of South Carolina College (later the University of South Carolina), serving as its president, 1820–34. In these later years Cooper defended slavery (which, earlier, he had vigorously opposed) and the doctrine of nullification. Among his scholarly works are *Institutes of Justinian* (1812) and *Discourse on the Connexion Between Chemistry and Medicine* (1818). See Alien and Sedition Acts; Nullification. E. B. Long

COOPERAGE is the making of barrels, casks, kegs, tanks, vats, and other circular or elliptical wooden vessels bound together by hoops. An ancient art, it has existed at least as long as the Christian Era. There are two classes of cooperage—tight and slack. Tight cooperage is the making of containers for liquids; slack cooperage involves the manufacture of containers for such dry articles as sugar, tobacco, and hardware. The former requires a better grade of wood and greater accuracy of construction.

A barrel, which is a typical example of cooperage, consists of three main parts: staves that make up its walls, headings that close its ends, and hoops that bind the staves together. The parts are sometimes manufactured in separate factories but more often in a single establishment. Staves are rounded to the curvature of the barrel and also bowed to make the finished barrel wider in the middle than at the ends; this double curvature of the staves makes an extremely strong container. The staves of tanks and vats usually are not bowed. Machinery has replaced skilled hand labor almost entirely in the making and fitting of staves. Hoops once were made of wood, but later iron and steel came to be used. These are sometimes put on hot so that their shrinkage in cooling will bind the vessel more firmly.

A recent development is the use of laminated staves built up of several layers of wood cemented together. These can be standardized so that all are alike and interchangeable, making it possible to take the container apart for economical packing when shipped empty. Cooperage has declined in importance because of competition from metal containers and because of the increasing scarcity of suitable lumber. See Barrel.

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CO-OPERATIVE

In many lands, groups of people have united to form and operate their own enterprises.

CO-OPERATIVE, an economic enterprise which is wholly owned by the users of its services. The patron-owners of a co-operative are its members, and the group itself is often called a "society" because the members bind themselves in a covenant to carry on business and related activities. A co-operative is formed by groups of people, such as farmers, households, or small businesses, when needed goods or services cannot be supplied effectively by the persons or firms acting individually.

COOPERATIVE LEAGUE OF THE USA

The Co-op General Store at Wheaton, Md., serves consumer-owners in suburban Washington, D.C. It is one of a group of enterprises operated by Greenbelt Consumer Services.

Types of Co-operatives. In the United States, the variety of co-operative enterprises covers almost every economic need. There are three general types:

Production co-operatives, sometimes called workmen's productive societies or laborers' co-operatives, are groups of workers who together own certain tools, plants, or other facilities and seek to sell their products on the general market. The members share in the net earnings in proportion to their contribution of labor. Examples of this type of co-operative are the builders' associations of France and other European countries.

Marketing co-operatives are sometimes called producer co-operatives in the United States because their greatest development has been among agricultural producers. These co-operatives act as agents for their members in pooling, storing, and selling the crops or products they have produced on their individual farms or in their plants. They protect their members by stabilizing the markets for their products, enabling them to sell under advantageous conditions and at favorable times instead of being subject to speculative influences. Usually an advance payment is made to the farmer at the time his crop is brought to the co-operative. When the whole crop has been sold the balance of the net income is divided among the members in proportion to the amount each delivered for sale. About a quarter of all farm produce in the United States is marketed by farmers through marketing co-operatives. In northern and western Europe, Canada, Japan, and some other countries, this proportion is even larger. See Marketing.

Consumer, supply, and service co-operatives form the third general type. Some, like credit unions and co-operative mutual insurance companies, simply provide a needed service. Others may purchase, process, or produce for their patrons such goods and services as farm supplies, electric power and light, or housing. Still others provide household supplies to consumers by purchasing at wholesale and retail. Health services, irrigation water, telephone service, burial services, and inventories for independent small businesses are other services provided by co-operatives of this type. Consumer co-operatives aim to supply their members and other patrons with certain needed goods or services. There are no fixed limits to the number of people who may benefit from their services or become their members.

Early History of Co-operation. Throughout history co-operation has enabled groups of people to overcome common difficulties, fend off dangers, and develop civilized life. Primitive farmers co-operated for mutual protection against bands of plunderers. The medieval guilds of Europe, the agrarian village communities, and some of the very old community organizations of the Far East were all essentially co-operative in nature. (See Guild.) Most migrations of

COOPERATIVE LEAGUE OF THE USA

At annual meetings held to elect directors and decide on basic policies of the co-operative businesses, each member has one vote regardless of the number of shares he owns.

peoples, including those of the covered wagon trains to the American West, were co-operative ventures.

The earliest formal organization of a co-operative enterprise in the United States was Benjamin Franklin's mutual fire insurance company in Philadelphia in 1752. The oldest extant consumer co-operative was founded at Lennoxtown, Scotland, in 1812. Two years earlier, Connecticut farmers organized the first co-operative dairy association in the United States. Less successful attempts were made in England, the United States, and elsewhere to lessen the evils of the new factory system by co-operative ownership of factories by their workers.

Rochdale Pioneers. In December 1844, 28 struggling weavers in Rochdale, England, established the first co-operative using the principles and practices now known throughout the world as the Rochdale Principles. From the beginning this store sold at regular market prices and distributed its earnings to each member in proportion to his patronage. This proved to be the key to success for co-operative businesses. The original capital was only £28, £1 for each member, which they had saved at the rate of twopence a week during the preceding year. On its hundredth anniversary in 1944, the Society of Equitable Pioneers of Rochdale had 90,000 members and was the largest merchandising business in that city.

Principles and Practices. The Rochdale Principles and Practices of Co-operation were formulated to serve the basic purposes of the organization. The four basic principles are: (1) open membership, (2) democratic control, (3) limitation on capital returns, and (4) patronage refund payments. The four usual practices are: (1) nonpartisanship and nonsectarianism, (2) sales at going market prices, usually for cash, (3) continuous growth and expansion, and (4) constant education of members on successful operation of their businesses.

Because their purpose is to meet people's needs, co-operatives have open membership. Any person or firm needing their services may become a member-owner by purchasing one or more shares. To avoid conflicts among a membership based on common economic needs, co-operatives are nonpartisan in politics and nonsectarian in religion. Democratic control is insured by giving each member-owner one vote and one only, regardless of the number of shares held. Only a limited amount of interest or dividends is paid. The earnings of the business belong to the customers and are distributed in proportion to their patronage; this is called the patronage refund. If the net margin above costs of operation and required reserve funds is 5 per cent in a given year, each patron receives a refund equal to 5 per cent of the amount he spent at the co-operative that year. Because this is a more certain way of achieving a nonprofit operation than by trying to sell at cost, co-operatives usually sell at going market prices and use the patronage refund principle. Like other businesses, co-operatives seek to maintain a healthy rate of growth and expansion. To make sure that their nature, purposes, benefits, and members' responsibilities are fully understood, co-operatives generally carry on educational programs among their membership.

Co-operatives in the United States

Co-operative organizations are almost as varied as the economic life of the United States. The Associated Press is a co-operative belonging to its member newspapers. At the other extreme is a tiny burial co-operative to which a handful of farm families in an isolated rural area belong. There is hardly an economic or social need in the United States which a co-operative somewhere is not endeavoring to meet for its members.

Credit Unions. Credit unions have grown out of the need for savings and credit. When a family breadwinner dies, illness strikes suddenly, or a youth goes to college, the average family needs a source of credit to tide it over. Before the coming of the credit union, banks generally were not willing to make small loans on the personal notes of people having little security—the very people whose need for credit was most urgent. By assembling the people's own savings, the credit union makes it possible for the whole group to meet the credit needs of individual members as they arise. See Consumer Credit; Credit Union.

Co-operative Mutual Insurance. All insurance is essentially a co-operative activity involving the pooling of savings and sharing of risks by a large number of persons, but not all insurance companies are organized along mutual or co-operative lines. Mutual insurance companies try to (1) develop active control by policyholders, (2) keep overhead costs at the lowest figure consistent with good operation, (3) return to policyholders, either in dividends or in premium reductions, as much of their money as possible while maintaining sound actuarial practices, and (4) pursue investment policies to put the policyholders' money to work in their own direct interest. Such companies may be called "co-operatively minded" insurance companies. Most of them have been organized to meet the insurance needs of groups already brought together around some other common interest, such as membership in farm organizations, labor unions, commodity co-operative organizations, or credit unions.

In 1955 about 1800 country "farmers mutual" fire insurance companies enabled farmers to share fire losses among themselves. The 12 companies affiliated with the Insurance Conference of the Co-operative League had about 10 million policyholders, $3 billion of life insurance in force, and some $300 million in assets. See Insurance.

Co-operative Health Plans were created mainly to meet the need for a budgeted method of paying for medical care which fits the average family income. In a typical plan the members pay monthly dues to an association which they control, and receive in return agreed-upon medical services through a staff of doctors and nurses who give all or part of their services to the group. Patronage refunds are not made, but the plans are operated at cost. The pioneer plan was the co-operative hospital at Elk City, Okla., organized during the early 1930s. After World War II membership in such plans grew rapidly. In 1955 co-operative and similar voluntary group health plans had more than one million members, and an additional nine million members of labor unions benefited from health services obtained either through union funds or through health and welfare funds. See Insurance, *Casualty Insurance.*

Co-operative Home Ownership. Housing of lower- and middle-income families through co-operative ownership has grown rapidly. Co-operative housing

in New York City has made the greatest strides in meeting the need for modest-priced homes. In 1955 about 30,000 people lived in co-operatively owned homes, mainly apartment houses. Most of them were member-owners of projects sponsored by labor unions in the needle trades. Amalgamated Homes, a co-operative in the Bronx, N.Y., dates from 1926. A community was created around the common ownership of these homes by 1400 families. They owned their own co-operative shopping center, had a credit union, organized summer camps for their children, and sponsored forums, lecture courses, and dramatic classes.

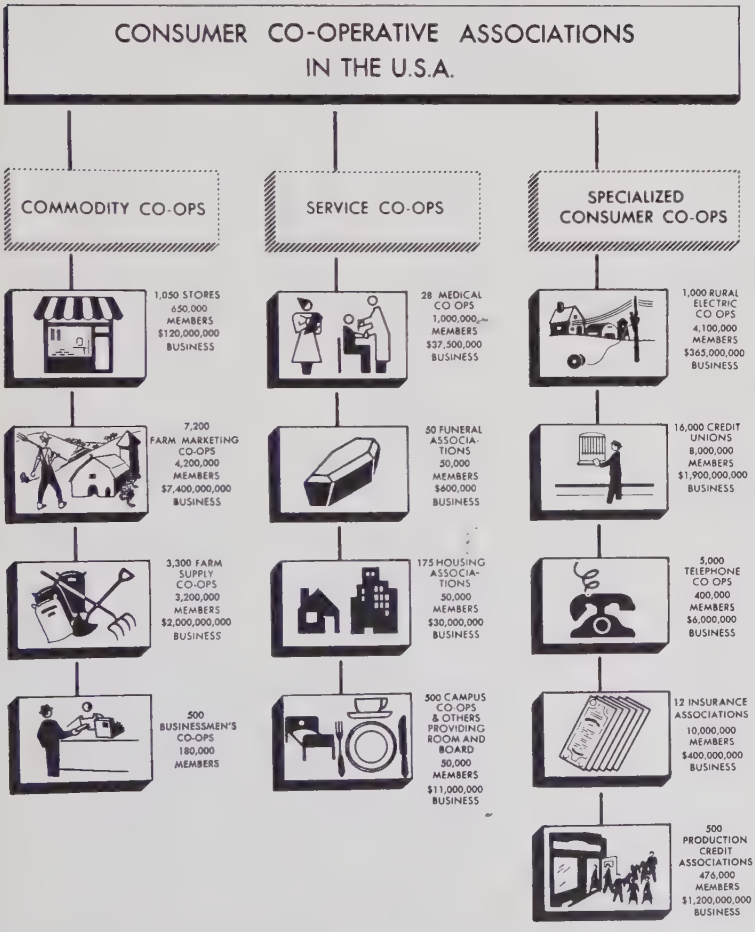
Co-operative Markets. In 1955 there were about a thousand co-operative retail markets in the United States with more than half a million members and an estimated annual trade volume of more than $120 million. To be successful the consumer co-operative must have a volume of business in natural trade areas large enough to make possible efficient co-operative wholesaling and some processing. "Co-op" labeled merchandise has achieved a good reputation for quality, and the informative labeling which these items carry have been an aid to the consumer. In the four areas of the country where consumer co-operative stores have developed best, co-operative wholesale organizations have been established. The first of these, Central Co-operative Wholesales, was founded at Superior, Wis., in 1917, and serves co-operatives in Upper Michigan, northern Wisconsin, and Minnesota. It is the only regional wholesale co-operative in the United States which deals both in consumer commodities and farm supplies on a large scale. The wholesale co-operatives and 18 other regional farm supply wholesalers jointly own National Co-operatives, with headquarters at Albert Lea, Minn. It manufactures milking machines and water heaters, and procures automobile supplies, appliances, hardware, and groceries for its member groups.

Groups of Independent Retailers. There are about 500 retailer-owned co-operative wholesale businesses in operation in the United States. They observe the one-member, one-vote rule, limit return on capital, and divide all net receipts among the members in proportion to patronage. As early as 1887, a group of New York druggists decided to pool their orders for a barrel of Epsom salts. As the chain store systems began to endanger the independent merchant's position, more and more retailer-owned wholesale houses were established. In 1955 about 100,000 grocers, 80,000 druggists, and thousands of hardware dealers, bakers, confectioners, furniture dealers, lumber and feed dealers, and others were served by these co-operative wholesalers. Through joint purchasing they give the independent business one of the advantages of the nationally integrated chain company. See Chain Store; Retail Trade.

Other Kinds of Co-operatives. In addition to these co-operatives there are co-operative funeral associations, irrigation systems, livestock-breeding associations, frozen locker plants, rural telephone systems, recreation societies, athletic clubs, students' co-operative book stores, and eating and rooming houses.

Rural Co-operatives. Co-operation is most widely accepted as a part of daily life among people in the rural areas. The Connecticut Dairymen's Marketing Association was the earliest agricultural co-operative. In the 1870s the Patrons of Husbandry, more commonly known as the Grange, began co-operative rural stores, one of which is still doing business at Cadmus, Kan. In the 1890s fruitgrowers' marketing co-operatives were organized on the Pacific Coast. Most of the present structure of co-operative business in the United States, however, was established during the agricultural depression which followed World War I. Almost all of the large regional wholesale and manufacturers' farm supply co-operatives were founded in the 1920s. The most rapid growth of co-operative business, in relation to the economy as a whole, took place in the depressed 1930s.

Farm Supply and Consumer Co-operatives. The combined farm supply and consumer co-operative is a well established institution in most of agricultural America. More than half the farm families in the United States are members of co-operatives of this type, which are found in most midwestern rural communities as well as in other parts of the country. With an annual business volume over $2 billion, these co-operatives supply about a quarter of the major farm and home needs of rural families.


CONSUMER CO-OPERATIVE ASSOCIATIONS IN THE U.S.A.
COMMODITY CO-OPS
SERVICE CO-OPS
SPECIALIZED CONSUMER CO-OPS
1,050 STORES 650,000 MEMBERS $120,000,000 BUSINESS
7,200 FARM MARKETING CO-OPS 4,200,000 MEMBERS $7,400,000,000 BUSINESS
3,300 FARM SUPPLY CO-OPS 3,200,000 MEMBERS $2,000,000,000 BUSINESS
500 BUSINESSMEN'S CO-OPS 180,000 MEMBERS
28 MEDICAL CO OPS 1,000,000 MEMBERS $37,500,000 BUSINESS
50 FUNERAL ASSOCIATIONS 50,000 MEMBERS $600,000 BUSINESS
175 HOUSING ASSOCIATIONS 50,000 MEMBERS $30,000,000 BUSINESS
300 CAMPUS CO-OPS & OTHERS PROVIDING ROOM AND BOARD 50,000 MEMBERS $11,000,000 BUSINESS
1,000 RURAL ELECTRIC CO OPS 4,100,000 MEMBERS $365,000,000 BUSINESS
16,000 CREDIT UNIONS 8,000,000 MEMBERS $1,900,000,000 BUSINESS
5,000 TELEPHONE CO OPS 400,000 MEMBERS $6,000,000 BUSINESS
12 INSURANCE ASSOCIATIONS 10,000,000 MEMBERS $400,000,000 BUSINESS
500 PRODUCTION CREDIT ASSOCIATIONS 476,000 MEMBERS $1,200,000,000 BUSINESS
PICTOGRAPH CORP.

COOPERATIVE LEAGUE OF THE USA

A seed storage warehouse is owned by the Utah Cooperative Association. Farmer co-ops operate many such plants, as well as oil wells, refining, and distributing facilities.

RUBENSTEIN, ILGWU

Jointly financed by a union mortgage and the tenant-owners was this modern four-building ILGWU co-operative village built on a slum-cleared portion of New York's East Side.

A typical farm co-operative does business in an entire county, operates a general store, a feed, seed, and fertilizer warehouse, a petroleum bulk plant and filling station, and, frequently, a farm machinery display room and a coal yard. Usually located in the principal trading center, it may operate branches in some of the smaller outlying communities. Linked with strong state or regional wholesale co-operatives, these rural units provide such items as high-quality fertilizer, dependable seed and stock feed, hardware, building supplies, electrical appliances, petroleum products and fuels, insecticides, groceries, and clothing.

Since the 1920s the rural co-operatives have built up substantial retail and wholesale volumes. As farmers' incomes dropped in the middle 1950s the volume of business of farm supply co-operatives continued to increase. Regional wholesale co-operatives have tended to move further into production. Feed is mixed, seed cleaned and processed, and fertilizer produced in hundreds of co-operatively owned plants across the country. In 1955 regional co-operatives operated more than 100 general fertilizer plants. Lumber mills and paint factories provided co-operative patrons with building supplies from their own establishments. Petroleum production by co-operatives more than doubled after World War II, and there were 2000 co-operatively-owned oil wells and twenty refineries.

Rural Electric Co-operatives. Eighty-nine per cent of U.S. farms had no electricity in 1935. The Rural Electrification Act, passed by Congress in 1935, provided that any competent borrower willing to furnish service to all farmers desiring it in an area might apply for low-interest, long-term government loans. Nearly all the loan applications came from co-operatives, which sprang up all over the country. From 1935 to 1955 the proportion of electrified farms rose from 11 to more than 90 per cent. Co-operative electrical distribution helped to reduce power rates; in Ohio, for example, rates generally were cut in half for all rural consumers. In order to obtain electrical supply at reasonable rates, some co-operatives established their own generating plants. When construction materials proved difficult to obtain at reasonable prices, the Wisconsin Electric Co-operative undertook central procurement and engineering functions for rural electric co-operatives in some 30 states. In 1955 there were about 1000 rural electric co-operatives distributing electricity to more than four million members. Annual payments by members for electric energy were close to $365 million.

Farm Credit. Congress established the farm credit system after the agricultural depression of the 1920s to relieve hard-pressed farmers from the burden of high interest rates. Government capital was provided in the early years, but by 1955 these loans had all been repaid by the regional Federal Land Banks and the 1200 farm loan associations connected with them. Thus they had become mortgage loan institutions co-operatively owned by their borrowers. About 90 per cent of the 500 production credit institutions, devised to finance crop production, were also wholly co-operative in ownership.

Agricultural Marketing Co-operatives. Marketing co-operatives necessarily limit their membership to producers of certain crops. They became widespread after 1900 as institutions to protect farmers against the hazards of speculation by providing storage facilities and marketing services. These groups have also helped to improve the quality of food products reaching the consumer by their stress on grading and labeling. Trade names of co-operatively marketed farm products—such as oranges, milk, raisins, potatoes, eggs, poultry, butter, and cheese—have proved reliable guides for quality products. Laboratories and by-products plants of citrus fruit co-operatives have developed frozen fruit juices, valuable oils, medicines, sprays, livestock feeds, and dozens of other products.

In 1955 there were about 7200 agricultural marketing co-operatives with a total of 4.2 million members, or two-thirds of all farm operators in the United States. The dairy co-operatives and the grain co-operatives are federated into two national organizations—the National Milk Producers Federation and the National Federation of Grain Co-operatives. American National Foods, an agency for terminal marketing of fruits and vegetables, is operated by local marketing co-operatives.

National Federations. There are three national federations serving co-operatives in general. The Co-operative League, founded in 1916, is the only national federation which includes co-operatives of all types—rural and urban, consumer, supply, and service. The league represents American co-operatives in the International Co-operative Alliance, which has headquarters in London and holds a world conference every three years. The American Institute of Co-operation is an educational agency for agricultural marketing and supply co-operatives. It works with land-grant colleges and other educational institutions in developing courses of study in the field of agricultural co-operation and holds an annual educational meeting on the operation of agricultural co-operatives. The National Council of Farmer Co-operatives is a conference body composed of many agricultural marketing and supply co-operatives. It performs legal and legislative work in Washington, D.C., and promotes research and expanded markets for agricultural products.

Co-operatives in Other Countries

Co-operative organizations throughout the world affiliated with the International Co-operative Alliance

claimed a membership of more than 120 million persons in 1955. Although few countries have developed co-operatives for as many different purposes as has the United States, co-operatives in some countries are far more important in relation to the national economy. Consumer co-operation had its start in England and developed rapidly in northern and western Europe, but in agricultural and fishery co-operation some Asian countries have fostered growth of modern co-operatives based on ancient village practices of mutual aid.

Great Britain. From the beginnings at Rochdale, retail co-operatives sprang up in many parts of Great Britain. In 1846 the Co-operative Wholesale Society was organized by 54 of these retail societies. By 1955 it was the largest single co-operative business in the world as well as the largest distributive enterprise in Great Britain. Its annual business volume exceeded $1250 million and its factories produced goods valued at $350 million. With about 11 million members, the affiliated retail co-operatives sold about one-third of all the tea, one-third of the milk, and one-fourth of all the bread consumed in England. About 15 per cent of total English retail and wholesale trade was carried on by consumer co-operatives. In Scotland the consumer co-operatives and the Scottish Co-operative Wholesale Society have achieved a comparable development to that in England.

Other Western Countries. More than half of the business of Iceland is carried on by co-operatives, which process and market fish, provide insurance and hotel service, supply consumer goods, and serve farmers' needs. In Finland the two federations of consumer and supply co-operatives account for almost 40 per cent of the country's wholesale and retail trade. In addition, co-operatives own numerous mills and factories which provide manufactured products for their members. Swedish co-operatives have an "active price policy," so that when a high price is being charged for a certain item, the co-operatives lower their price, thus causing other businesses to do likewise. To make this policy effective the Scandinavian wholesale co-operatives, notably the Swedish *Kooperativa Forbundet*, have bought or established factories. Swedish consumer co-operatives carry on about 17 per cent of the total retail and wholesale trade in that country. In Denmark and Norway the proportion is almost as large.

In West Germany consumer co-operatives, virtually destroyed under the Nazi regime, rebuilt their membership and structure after World War II. The *Grosseinkaufsgesellschaft* (co-operative wholesale society) has a large annual business volume including important processing and manufacturing enterprises. In 1955 about 10 per cent of the retail food in West Germany was supplied by co-operatives. Substantial consumer co-operative developments exist in Holland, Belgium, France, Austria, Switzerland, and Italy. A large part of Israel's economy has been built on a co-operative basis. Co-operative building associations have erected much of the country's residential housing. About one-third of the population is served by consumer co-operatives through 1000 stores.

Co-operative insurance companies have also been established in most of the countries of western Europe. In Britain and Sweden the co-operative companies are among the largest and most respected in the nation. Co-operative home ownership has reached its greatest development in the Scandinavian countries.

Farm Co-operatives. Agricultural co-operation is generally popular throughout Europe. Most farmers in West Germany are members of agricultural credit societies which trace their origin to the work of Frederick Raiffeisen in the 1840s. Similar rural co-operative credit societies exist in Holland, Scandinavia, and other countries. In Holland, France, Austria, and Germany, most farmers market their crops and obtain their supplies through co-operatives. In Italy there are co-operatives of dairymen, fruitgrowers, wine producers, and other agricultural groups. A strong agricultural co-operative federation exists in Greece. Agricultural co-operatives are especially strong in Scandinavia, with Denmark having perhaps the best system of agricultural co-operatives of any country.

In contrast to consumer co-operation, co-operation in agriculture is far advanced throughout the world. A significant development is the Kilimanjaro Native Co-operative Union in Tanganyika, Africa, through which some 35,000 African coffee farmers market more than 5000 tons of coffee each year. This co-operative operates a school for children in the area, which has resulted in a 75 per cent literacy rate. Coffee and sugar growers in Puerto Rico, Jamaica, Brazil, and other countries have marketing co-operatives which bring them good returns for their crops. Canadian co-operative wheat pools market half of Canada's annual grain crop. Dairymen's and general purpose farmers' co-operatives bring the total volume of co-operative marketing in Canada to more than $1 billion a year.

For centuries, Japanese farmers have been co-operatively organized, but under the feudal system the co-operatives were dominated by feudal lords. Since World War II democratic organization and control have been introduced and a pattern of general purpose co-operatives, providing credit, marketing services, and supplies, has been established. India has thousands of co-operative agricultural credit societies, while in Burma co-operatives handle the marketing of rice. The Republic of Indonesia has made the development of co-operatives a government policy and it has claimed that more than 5000 co-operatives have been organized in villages. Most of these are general-purpose co-operatives which begin as credit societies of farmers or craftsmen to relieve the people from money-lenders, and then add such services as procurement of supplies, marketing of crops and products, and co-operative ownership of tools and equipment.

Fishery Co-operatives. Faced with insecurity at sea and on the market, fishermen in many countries have co-operative organizations. Most of Norway's fishermen are members of co-operative fish marketing associations. Japanese fishery co-operatives, which exist in every important fishing village, have been reorganized since World War II to insure more democratic control. Strong co-operatives exist among the fishermen of Canada, especially in Nova Scotia and the other Maritime Provinces. A pattern of co-operative economy, including credit unions, housing co-

Nestled in the Lötschen Valley in the Swiss Alps, this bakery in the quaint village of Wyler does the baking for the entire community. Swiss co-operatives are numerous.
PHOTOGLOB-WEHRLI & VOUGA, ZÜRICH

operatives, fish and farm crop marketing groups, and consumer societies, has been fostered by the Antigonish Movement centered in the Catholic University of St. Francis Xavier, a major training center for the co-operative movement throughout the world. See AGRICULTURE IN THE UNITED STATES; DAIRY INDUSTRY; FISHERIES; TRADE AND COMMERCE.

JERRY VOORHIS

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CO-OPERATIVE COMMONWEALTH FEDERATION is a socialist party in Canada, popularly known as the the C.C.F. Founded in 1932 by J. S. Woodsworth through a merger of separate farmer, labor, and socialist movements, the party's doctrine and program were based on those of the British Labour party. After abandoning some of its original radicalism, the C.C.F. won the 1944 provincial election in Saskatchewan as well as the succeeding 1948 and 1952 elections. The party was, however, less successful outside Saskatchewan and British Columbia (where it is the official opposition), and in the 1953 federal election it won only 23 out of 265 seats in the federal parliament.

The C.C.F. advocates a planned economy, the public ownership of the banks and certain key industries, a system of national health insurance, a bill of rights, and a series of other social and economic measures. Some of these measures were introduced in Saskatchewan by the C.C.F. government, including a province-wide hospital insurance plan.

CO-OPERATIVE EDUCATION is the educational program in which periods of school or college attendance alternate with periods of related work experience. Under this plan, two students co-operate on each job or series of jobs, with one student remaining in school while the other works. Periodically, usually about every three months or four times a year, they trade places; thus each job is filled throughout the year and school facilities are fully used but not overtaxed. The students are paid the going rate for the work they do, and the employer's evaluation of the students' work performance becomes a part of their school record and serves as the basis for job counseling.

A Northwestern Technological Institute engineering student tests a distribution transformer on his co-operative job at a public utility company plant in northern Illinois.

NORTHWESTERN UNIV.

Co-operative education originated in attempts to provide practical work experience and on-the-job industrial training for engineering students. The college of engineering of the University of Cincinnati inaugurated the co-operative program in 1906. Later the same program was set up in the colleges of business administration and of applied arts. (See CINCINNATI, UNIVERSITY OF.) A similar plan has been used for all Antioch College, Ohio, students since 1921. Dozens of employers in more than 30 states hire Antioch students and give them training and experience in business, industry, government and public service, research organizations and laboratories, hospitals, libraries, museums, public and private schools, and social agencies. (See ANTIOCH COLLEGE.) The co-operative plan is most widely used in engineering schools, with more than 30 institutions participating.

The co-operative education plan has been adopted by a number of universities to provide specialized advanced training, supplemented by necessary research experience, for students of the atomic sciences. Planning by Northwestern University and the Argonne National Laboratory illustrates the development of a co-operative education program for science and engineering students.

Critics of co-operative education claim that the system tends to overemphasize a narrowly vocational approach to higher education; on the other hand, advocates say it extends the college campus into the social and economic world in which the student's learning will be put to use. Some educators have pointed out the danger that students may be assigned to clerical work or routine jobs that contribute nothing to their knowledge or experience. A Committee on Aims and Ideals of Co-operative Education of the American Society for Engineering Education has recommended that the employment phase of the program should be constituted as a regular, continuing, and essential element in the educational process, and should contribute to the student's growth and development. See ENGINEERING; HIGHER EDUCATION IN THE UNITED STATES.

COOPERATIVE FOR AMERICAN REMITTANCES TO EVERYWHERE. See CARE.

CO-OPERATIVE HOUSING. See HOUSING, *Home Ownership*.

COOPER-HEWITT LAMP, the original mercury-vapor electric lamp, widely used in industry and for lighting streets and highways. It was named for its inventor, Peter Cooper Hewitt. See HEWITT, PETER COOPER; MERCURY VAPOR LAMP.

COOPERING. See COOPERAGE.

COOPER RIVER, SE South Carolina, rises in Berkeley County, flows in a southerly direction to its mouth at Charleston on the Atlantic Ocean. The river is fed by water through the Pinopolis Dam from its reservoir, Lake Moultrie. The Cooper is joined at its mouth by the Wando and Ashley rivers to form Charleston Harbor.

COOPER'S CREEK, or Barcoo River, E. Australia, rises in Queensland, formed by two headwaters, the Thomson and the Barcoo rivers. It flows southwestward draining into Lake Eyre. The river is intermittent, drying up in the rainless seasons. In 1861, near the stream, the explorers Robert Burke and William Wills died of starvation on their return journey across the continent.

NAT. BASEBALL HALL OF FAME AND MUS.

The National Baseball Hall of Fame and Museum at Cooperstown, N.Y., contains souvenirs of memorable contests and plaques honoring the "greats" of the national game.

COOPERSTOWN, village, E central New York, county seat of Otsego County, situated at the S end of Lake Otsego, the source of the Susquehanna River; on the Delaware and Hudson Railroad; 33 miles SE of Utica. Cooperstown is located in a summer resort and agricultural area. The city was founded by William Cooper in the late eighteenth century. In 1798 he built Otsego Hall, the residence where his famous son, James Fenimore Cooper, wrote *The Deerslayer* and other novels. On the site of Otsego Hall is a monument to the author in a memorial park called Coopers Grounds; the author is buried in the churchyard. Cooper mementos are kept in Fenimore House, central headquarters of the New York State Historical Association. The Farmer's Museum has a notable collection of early American handicraft. The village is the site of the National Baseball Hall of Fame and Museum, which annually attracts many visitors. On nearby Doubleday Field, Abner Doubleday is said to have staged the first baseball game in 1839. Pop. (1950) 2727.

COOPER UNION, or The Cooper Union for the Advancement of Science and Art, New York City, was founded by Peter Cooper in 1859 to provide free education in the arts, sciences, and technology for working people. Students are selected for the tuition-free program by competitive tests. Degrees are offered in chemical, civil, electrical, and mechanical engineering, and in the fine and graphic arts, and architecture. Since 1860 Cooper Union has conducted adult education programs which are open to the general public. These have included weekly forum meetings at which many nationally noted figures have appeared. One of the first speakers was Abraham Lincoln, whose important address there in 1860 is regarded as having helped him to win his first Republican nomination for the presidency. The Cooper Union main library was established in 1858 as New York's first free public reading room. See Colleges and Universities; Cooper, Peter.

COORDINATES, in geometry and applied science, are numbers used to express the relative positions of the points, lines, and surfaces of the geometrical or mechanical problem under consideration.

Plane Systems. A directed line is a straight line upon which a positive direction has been chosen. If a reference point O (the origin) and a unit of length are chosen, a uniform scale may be marked on the line. The positive integers, 1, 2, 3, . . . are made to correspond, in order, to the marked points on one side of O, and the negative integers, -1, -2, -3, . . . to the marked points in the other direction. It is assumed that every point of the line corresponds to a real number which measures its distance from O in terms of the unit. The difference between two numbers measures the distance between their corresponding points. The result is a one-dimensional coordinate system. (See Fig. 1.) If a second line OY intersects the first at O and has a similar scale starting at O with the same or a different unit, any point P in the plane of the lines may be located as follows: assume lines are drawn through P parallel to OY and OX, intersecting the axes at A and B (see Fig. 2). The number

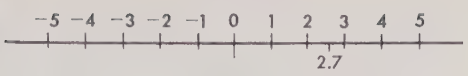


Fig. 1. One-dimensional Coordinates

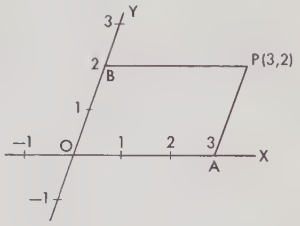


Fig. 2. Two-dimensional Coordinates

a corresponding to A, which measures its distance from O (and also the distance of P from OY), is called the abscissa of P. The number b corresponding to B is called the ordinate of P. Together these numbers are the coordinates of P in a two-dimensional Cartesian coordinate system. The position of P relative to the axes OX and OY is given by the ordered number pair (a, b), in which the abscissa is always given first. Conversely, any ordered pair of numbers, for example (3, 2), fixes a point. It is customary to make the axes perpendicular so that the network of parallels is rectangular. In some cases nonuniform scales are used.

Polar Coordinates. This system describes the position of a point P in a plane by giving the number r measuring its straight-line distance from the origin in terms of the unit, and the measure of the angle POX between this line and the initial line OX. See Fig. 3.

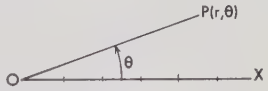


Fig. 3. Polar Coordinates

Three-dimensional Systems. In three dimensions a third axis OZ is added, usually perpendicular to the other two. The three intersecting lines taken in pairs determine three intersecting planes, the YOZ-plane, XOZ-plane, and the XOY-plane. A point is fixed by three coordinates which give its distance from these planes. Conversely, the position of a point can be described by an ordered triple of numbers, as $P(4,3,6)$ (see Fig. 4). Several other systems are also used. The distance OP (Fig. 4) may be given, together with three angles POX, POY, and POZ. These four numbers are the polar coordinates of P in three dimensions. More commonly spherical coordinates are used, namely, the radius vector $r = OP$; the angle

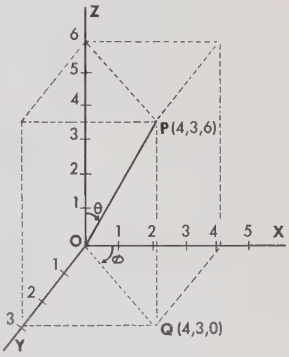


Fig. 4. Three-dimensional Coordinates

$\theta = \angle POP$, or colatitude; and the angle $\alpha = \angle OQ$, the longitude. The angle QOP, the latitude, may be used instead of θ. Thus the position of P may be indicated by the number-triple (r, θ, α). Sometimes cylindrical coordinates are used, namely, the values of OP, angle XOQ, and QP, or (r, α, z).

The method of Cartesian coordinates has great advantages in physical applications, although for certain problems, such as those connected with motions of the planets, polar coordinates are found more convenient. Where rotations enter into the problem, as in the spinning top and gyroscopic motion generally, angles are the more appropriate coordinates. In many physical problems, however, the quantities that determine the state of a system may be neither distances nor angles. They may nonetheless be represented graphically by coordinates measured along axes. Consider, for example, the pressure, volume, and temperature of any chosen substance in the gaseous state. These may be taken as coordinates referred to three mutually perpendicular axes. As the physical conditions change the corresponding points change, moving upon a surface each point of which is a symbol for the simultaneous values of pressure, volume, and temperature that are possible.

Latitude and Longitude. On the surface of a sphere, for example, the earth, a two-dimensional system suffices. Two points at opposite ends of a diameter are chosen as poles (N, S, Fig. 5) through which are drawn great circles (circles whose planes pass through the center C of the sphere), called lines of longitude, or meridians. One of these is chosen as the circle of zero longitude, NOS; for the earth the one through Greenwich, England, has been arbitrarily chosen. A second great circle is chosen whose plane is perpendicular to the polar diameter at the center. This is called the equator AOB. The origin O is one of the two intersections of these two great circles, NOS and AOB. Any great circle through the poles intersects the equator at right angles in a point such as Q; the plane angle OCQ, usually given in degrees, is the longitude of any point P on that circle. Although longitude may be measured from 0° to 360°, it is customary on maps to use 0° to 180° both east and west of the meridian through Greenwich. Any plane parallel to the plane of the equator cuts the sphere in a small circle, or latitude circle. The angle QCP in the plane of the great circle through N, P, and Q is the latitude of P. Since meridians converge at the poles, the same differences in longitude, when converted to lengths, represent smaller distances near the poles than at the equator. But since small circles are parallel to each other, the same differences in latitude represent the same linear distance everywhere on the surface of a sphere. On the earth, of course, which is somewhat flattened at the poles, the length of a degree of latitude increases slightly toward higher latitudes. See Coordinates, Celestial; Geocentric. M. L. Hartung

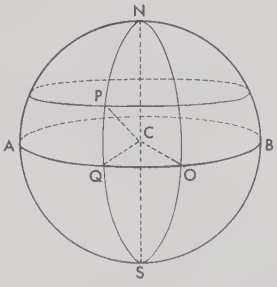
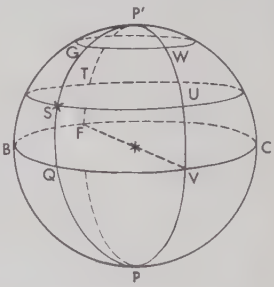


Fig. 5. Geographic Coordinates

COORDINATES, CELESTIAL, a pair of numbers used to specify the location of a heavenly body on the celestial sphere (see Astronomy, *Celestial Sphere;* Coordinates, *Latitude and Longitude*). Several systems, all constructed on the same pattern, are in everyday use by astronomers. The systems have these features in common: (1) a fundamental great circle, $BQVCFB$ (see figure); (2) two poles, P and P', each 90° from the fundamental circle; (3) a set of parallels, or secondary small circles, such as $SUTS$ and GWG, whose planes are parallel with the plane of the fundamental circle; and (4) a set of secondary great circles, such as $PBP'CP$ and $PVP'FP$. These circles have as a common diameter the line joining the poles, and they intersect the fundamental circle and the parallels at right angles. The line joining the poles is perpendicular to the plane of the fundamental circle and is bisected by that plane. See Great Circle.



Celestial Coordinates

The location of a star S, for example, is given in any system by two coordinate numbers. One number is the angular distance QS from the fundamental circle to the star, measured in degrees along a secondary great circle. The second number is an angular distance, measured in degrees or in equivalent time units along the fundamental circle from some point chosen as origin to the foot (intersection with the fundamental great circle) of the secondary great circle that passes through the star. The celestial coordinate systems most likely to be encountered are shown in the accompanying charts, along with the latitude-longitude system of geography (see Latitude and Longitude). The capital letters on the charts refer to letters in the figure, which serves to illustrate each of the systems in turn.

The equator system, whose coordinates are declination and right ascension (see Right Ascension), is the system most widely known because it is the one used for cataloguing and mapping star positions. In star maps north is at the top but, unlike geographic

I. CHART FOR COMPARING SYSTEMS OF COORDINATES, CELESTIAL AND GEOGRAPHIC

Coordinate System Name	Physical Basis of System	Fundamental Great Circle BQVCFB *	Poles of the Fundamental Great Circle P,P' *	Secondary Great Circles Through the Poles PGSQP', PWUVP' *	Secondary Small Circles SUTS, GWG *
EQUATOR	Rotation of the earth	Celestial equator	Celestial poles; N, S	Hour circles through star	Declination circles
ECLIPTIC	Plane of earth's orbit	Ecliptic inclined 23½° to celes. eq.	poles of the ecliptic	Secondaries to ecliptic through star	Celestial latitude circles
GALACTIC	Plane of the Milky Way	Galac. eq. inclined 62° to celes. eq.	Galactic Poles	Secondaries to galac. eq. through star	Galactic latitude circles
HORIZON	Direction of gravity	Astronomical horizon	Zenith and nadir	Vertical circles	Almucantars
GEOGRAPHIC LAT.–LONG.	Rotation of the earth	Terrestrial equator	Geographic poles; N, S	Meridians of longitude	Latitude circles

*See figure, Coordinates, Celestial.

II. NAMES AND DEFINITIONS OF COORDINATES

Coordinate System Name	Coordinate Measured From Fund. Circle to Star* Along Secondary Gt. Circle	Coordinate Measured Along the Fundamental Great Circle to Foot of the Secondary Gt. Circle Through Star*			
	in degrees, 0°–90° Q_S*	coord. name	direction measured	from origin V*	units
EQUATOR	Declination (δ) North + South −	Right ascension (RA) VCFBQ*	Eastward**	Vernal equinox	Hours, min., sec.
		Hour angle VQ*	East or West	Celestial meridian	Hours, min., sec.
ECLIPTIC	Celestial latitude North South	Celestial longitude VCFBQ*	Eastward**	Vernal equinox	Degrees 0°–360°
GALACTIC	Galactic latitude North South	Galactic longitude VCFBQ*	Eastward**	RA, 18h44m δ, 0°	Degrees 0°–360°
HORIZON	Altitude + above, − below the horizon	Azimuth VQ*	Westward***	South point of horizon***	Degrees 0°–360°
GEOGRAPHIC LAT.–LONG.	Latitude North South	Longitude	East and West	Meridian of Greenwich	Degrees 0°–360°

*See figure **East is counterclockwise as seen from the north ***See Azimuth

maps, east is on the left. Declinations (in degrees) are the vertical coordinates on such maps, and right ascensions (in hours, usually written in Roman numerals) are the horizontal coordinates. Since right ascension increases toward the east, these numerals progress from right to left on star maps. Except for the names of the coordinates, this system is the exact analogue of the latitude-longitude system of geography. The circles of the equator system are projections on the celestial sphere of the corresponding geographic circles. In actual observing, astronomers commonly use a coordinate called hour angle (see HOUR ANGLE). It is the angular distance of an object east or west of the celestial meridian, measured in time units: 1 hour = 15°, 1 minute = 15′, and 1 second = 15″. This coordinate of a star is a constantly changing one, of course, but is quite useful to an observer.

The ecliptic system is the natural one to use for recording and studying the motions of the planets, since these bodies are never very far from the ecliptic (see ECLIPTIC; ZODIAC). In the *American Ephemeris and Nautical Almanac*, published annually, these coordinates are tabulated for the moon and the planets. The galactic system is used in modern studies of the distribution of stars and other matter in our galaxy, and of the sun's place among the stars (see MILKY WAY). The equator, the ecliptic, and the galactic systems are fixed on the celestial sphere. The horizon system of coordinates, however, is fixed with reference to the observer. For this reason the horizon coordinates of a star change through the night as the star moves across the sky. See CONSTELLATION.

COORG, also Kodagu, state, SW India, bounded by Mysore on the N and E and Madras on the S and W; area 1586 sq. mi.; pop. (1951) 229,405. Coorg is situated in the Western Ghats; it is hilly and forested. The state is drained by the upper Couvery River and its tributaries. Agriculture is the principal occupation; the major crop is terrace-grown rice. Coffee, cardamom, rubber, peppers, tea, and oranges are also important. The chief language is Kodagu, a Dravidian tongue. Coorg came under British control in 1834; in 1950 it became a state administered by a chief commissioner resident at Mercara, the capital, aided by a legislative assembly.

COORNHERT, DIRCK VOLCKERTSZOON, 1522–90, Dutch scholar, was born in Amsterdam. A copper engraver of note, he became a notary in Haarlem, and was appointed secretary of the city, 1562. Imprisoned by the Spaniards, 1568, he escaped to Germany and returned in 1572 to serve as secretary of state under William of Orange. As a theologian Coornhert opposed Calvinism as well as Roman Catholicism; he stood for religious tolerance and was against capital punishment for heretics. He was a translator of Cicero, Seneca, Erasmus, and Homer, and was credited with helping to restore the literary language of Holland. He wrote *Zedekunst, dat is Wellevens kunst* (1586), numerous pamphlets, and poetry. His collected works were published in 1630.

COORONG, THE, lagoon, an arm of brackish and shallow water, SE South Australia, separated from the Indian Ocean by a narrow tongue of sand. The lagoon, which averages 2 miles in width, extends from near the mouth of the Murray River for about 100 miles in a southeasterly direction.

COOSA RIVER, NW Georgia and E Alabama, formed by the junction of the Oostanaula and Etowah rivers at Rome, Ga. It meanders across Georgia and Alabama in a southwesterly direction for about 285 miles, uniting with the Tallapoosa River about 10 miles north of Montgomery to form the Alabama River. The Coosa River valley is the southernmost section of the Great Appalachian Valley, a chain of valleys in the Appalachian Mountains which extend southwesterly from the St. Lawrence Valley in Canada. The Coosa River is navigable for barges through its entire length because of a system of dams and locks. The principal dams are in the lower course. These are the Jordan Dam, forming Jordan Lake; the Mitchell Dam, forming Lake Mitchell, and Lay Dam, forming Lay Lake. The dams also are sources of electric power. The most important city on the river is Gadsden, Ala. (see GADSDEN).

COOS BAY, city, SW Oregon, in Coos County, on Coos Bay; on the Southern Pacific Railroad, and on U.S. Highway 101; 12 miles inland from the Pacific Ocean, 75 miles SW of Eugene. A port of entry, it has a deepwater harbor and is a thriving ocean port. The principal industry of the city is lumbering; commercial fishing and canneries processing salmon, tuna, striped bass, crabs, and oysters are important. There are also coal mines in the area. In the surrounding agricultural region are dairying and plant nurseries and vegetables, berries, and small fruits are grown. The city was known as Marshfield until 1944. Pop. (1950) 6223.

COOS BAY, inlet, SW Oregon, indentation of the Pacific Ocean, about 200 miles S of the mouth of the Columbia River. The bay is about 13 miles long and a mile wide. It provides a major deepwater port between San Francisco and the Columbia River.

COOT is a slender aquatic bird that is widely distributed throughout the Northern Hemisphere. A member of the family *Rallidae* (see RAIL) the American coot, *Fulica americana*, is found in marshes and swamps from Alaska to the northern areas of South America. From 13 to 16 inches long, the American coot has a black head and neck; the rest of the body is slate gray with white bars showing on the wings during flight. The coot is an awkward flyer. During its 4-week moulting period it is flightless and remains hidden in the marshes. Its nest is a simple platform made of aquatic plants over shallow water. There are about 30 common names for the American coot, including mud hen, sea crow, whitebill, and marsh hen.

American Coot

COPACABANA, town, W Bolivia, in the department of La Paz, on the Copacabana Peninsula of Lake Titicaca, 66 miles WNW of La Paz. Copacabana is a resort center and lake port. It is also an important Roman Catholic pilgrimage center. Pop. (1950) 1981.

COPAIBA, a pale yellow or yellowish brown viscid liquid possessing an aromatic odor and bitter taste. Copaiba is an oleoresin obtained from the trunk of the tree *Copaifera landsdorfii*, which is found in South America and the West Indies. Taken orally, it was used for the treatment of urogenital infections, especially gonorrhea. Because it irritates the stomach and intestines, causing colic, diarrhea, and skin eruptions, it has been largely replaced as a therapeutic agent. See BALSAM; RESIN.

COPAIS, drained lake, E central Greece, in the division of central Greece and Euboea, in the department of Boeotia, in the plain E of Levádhia. Throughout the classical period of Greek history the lake was a series of malaria-infested swamps. The ancient Greeks attempted to drain the area by constructing channels through rocks. In modern times the lake was drained and canalized, reclaiming more than 50,000 acres of fertile land now devoted to wheat and other crops.

COPAL is a resinous substance present in several tropical trees. It may be obtained directly from the living tree or may occur in a semifossil condition closely resembling amber. The best grade of copal is found in Zanzibar and has been extensively used in manufacturing high grade varnish. It has been largely supplanted by synthetic cellulose lacquers. The resin is insoluble in organic liquids, but on being heated when undergoing chemical change it becomes soluble in a wide variety of coal-tar products. See AMBER; RESIN.

COPÁN, town, W Honduras, in the department of Copán, on the Copán River, 140 miles WNW of Tegucigalpa and 5 miles from the Guatemala border. Copán is a popular tourist mountain resort famous for the remarkable Mayan ruins in the vicinity. These include temples, truncated pyramids, monoliths with sculptured human figures, a stone calendar, stadium, and a hieroglyphic stairway. Pop. (1950) 977.

COPE, EDWARD DRINKER, 1840–97, U.S. naturalist, was born in Philadelphia, Pa. As a precocious youth, Cope became interested in the natural sciences and devoted his life to that work. He studied at the University of Pennsylvania, Smithsonian Institution, and the Philadelphia Academy of Natural Sciences and published his first paper at the age of 19. Cope was professor of comparative zoology and botany at Haverford College, 1864–67, and curator of the Philadelphia Academy of Natural Sciences, 1865–73. After 1889 he taught at the University of Pennsylvania and was owner and editor of the *American Naturalist*, 1878–97. Cope was connected with several geological surveys, published some 600 papers, and laid the foundations for the modern classification of North American fishes, reptiles, and amphibians. He was a leading advocate of the Lamarckian theory of evolution. His works include *Origin of the Fittest* (1886) and *Primary Factors of Organic Evolution* (1896). See LAMARCK, JEAN.

COPENHAGEN or **KÖBENHAVN,** city, E Denmark, capital of Denmark, on E Sjaelland (Zealand) and N Amager islands, in the amt of Copenhagen but administratively distinct, on the Öresund separating Zealand from Sweden; pop. (1950) 765,580.

Economic and Cultural Features. Copenhagen is not only the capital of Denmark but the largest city and industrial center in the country. Approximately one-fourth of the total population of Denmark lives in the metropolitan area of Copenhagen. The city is also the major Danish seaport, naval base, and communications center. Leading industries include the processing of agricultural produce, shipbuilding, automobile assembly, and the manufacture of machinery, chemicals, textiles, metal goods, construction materials, furniture, pottery, beverages, and tobacco. The city is a major cultural center of Scandinavia with many educational and scholarly institutions.

The business center of Copenhagen is the original city center where parks and boulevards have replaced the old defense works. In the central section of the city, on Sjaelland (Zealand) Island near the neck of water which separates Sjaelland and Amager Island, is Kongens Nytorv, the chief square of the capital. Fronting on the square is Charlottenborg Palace, dating from the seventeenth century, which now houses a museum. Also on Kongens Nytorv are the Royal Theater, several commercial buildings, and a canal leading to the harbor known as Nyhavn. To the northeast of Kongens Nytorv is the Palace of Amalienborg in which the Danish royal family resides, the Frederikskirke (Frederick's Church) with its magnificent copper-sheathed dome, the Applied Arts Museum, and the seventh century Citadel, near which is the famous bronze statue of Hans Christian Andersen's "Little Mermaid." Northwest of the city center is the seventeenth century Rosenborg Palace and its noted gardens containing the Danish royal regalia. Other features of interest in the central section of the capital are Trinity Church with a famous round tower; the University of Copenhagen

AVA HAMILTON

A Mayan Stele at Copán

DANISH INFORMATION OFFICE

An eye-catching view of Copenhagen features Amalienborg Palace and the city's famed Marble Church, upper left.

(founded 1479), the oldest university in Scandinavia; the cathedral; the Tivoli amusement gardens; and the striking Danish Renaissance Town Hall built at the turn of the nineteenth century. Just south of Kongens Nytorv is the Slottsholm, an island formed by arms of the harbor and largely occupied by the Christianborg Palace. Christianborg Palace was originally built in mid-eighteenth century but has since been greatly altered. It now contains the two houses of the Danish parliament, the Ministry for Foreign Affairs, and reception chambers. Nearby are the seventeenth century Exchange, Thorvaldsen Museum, and the Royal Library. Three rectangular lakes separate the old section of Copenhagen from the newer portions to the northwest. Frederiksberg is the principal suburb and contains the seventeenth century Frederiksberg Palace, now a national museum. On Amagar Island is the modern Christianhavn district which contains the extensive dockyards, including those of the navy. The harbor is in three main sections: the South Harbor, the Inner Harbor between Sjaelland and Amager islands, and the North and Outer harbors. The North Harbor contains a free port which was established in 1894.

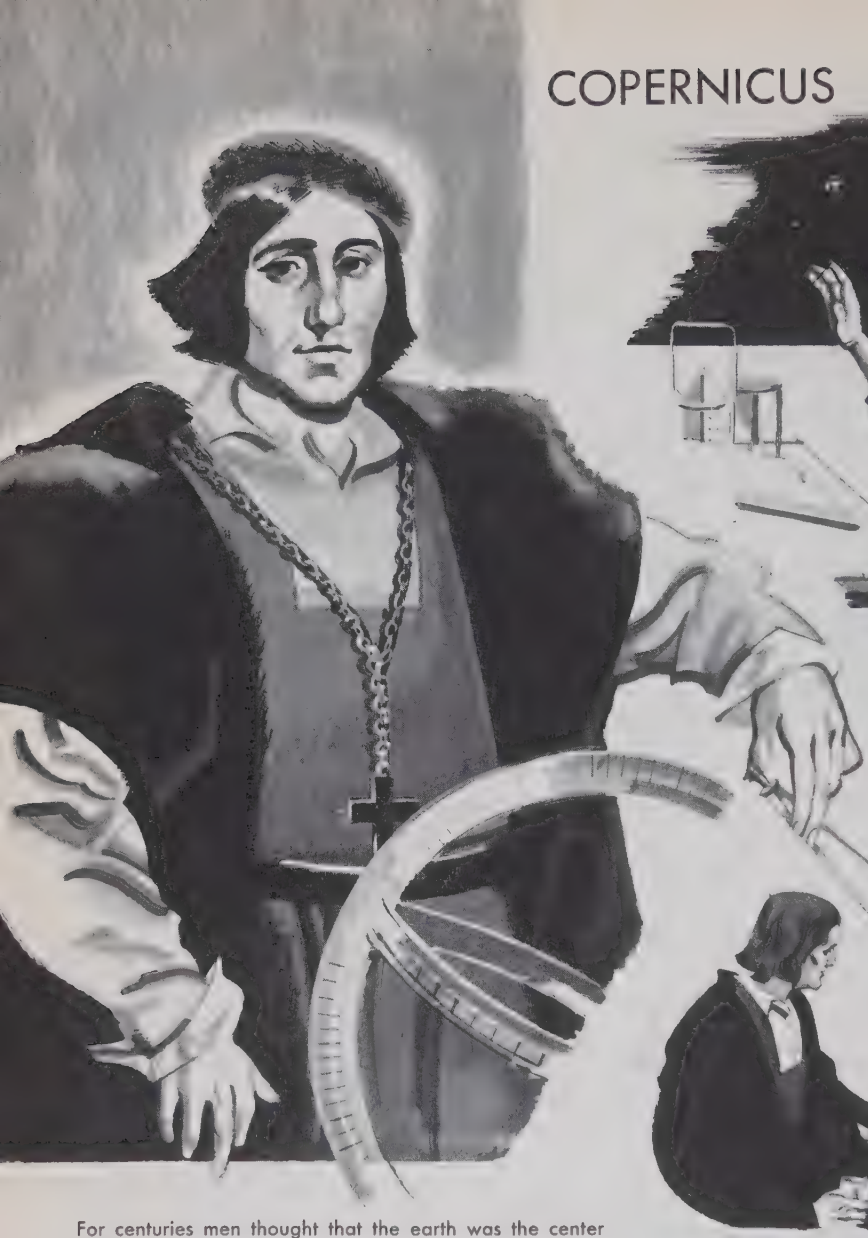
History. Copenhagen is first mentioned in 1043 as Hafnia, a fishing village. The settlement was fortified in 1167 and the city was chartered in 1254 by the Roskilde bishops. It became the royal residence and capital of Denmark in 1443 under Christopher I. During the period from the thirteenth to the sixteenth centuries Copenhagen was attacked many times by the cities of the Hanseatic League. In 1658–59 the city was besieged by Swedish forces. It was besieged again in 1700 by a British, Swedish, and Dutch fleet. In 1801, during the Napoleonic Wars, Lord Nelson, under the over-all command of Admiral Sir Hyde Parker, defeated the Danish fleet in Copenhagen harbor and bombarded the city. A second bombardment of the city was carried out by the British in 1807. During World War II Copenhagen was occupied by the Germans from 1940 to 1945, but the city was only slightly damaged. See DENMARK.

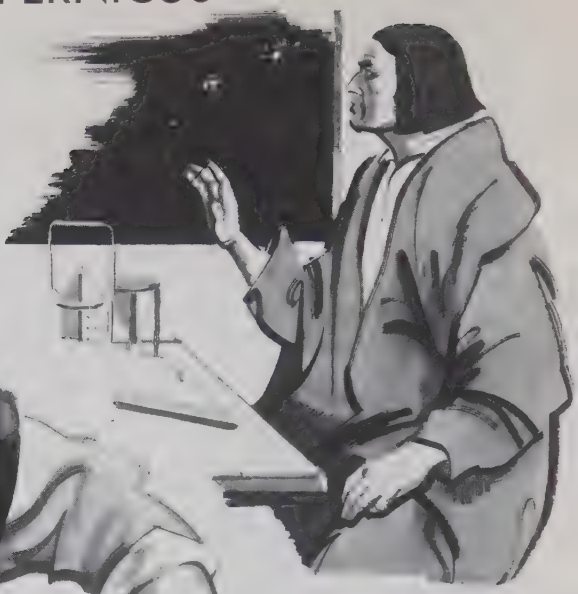
COPEPODA is an order of small to microscopic crustaceans whose members may be free-swimming, commensal, or parasitic (see CRUSTACEA). A free-swimming genus such as the fresh-water *Cyclops* has a large head with three ocelli fused as a median eye, a cephalothorax composed of five or six segments, and an abdomen of three to five segments. There is no shell. In the breeding female the two external egg sacs are conspicuous objects. These "water fleas" are often bright red in color and always active in movement so that in spite of their small size they are conspicuous in both fresh and salt water and furnish an important part of the food supply for many fishes. Strikingly different in appearance are the "fish lice," or parasitic forms, which commonly occur on the gills of fish. As a rule the male is less modified than the female and often is less markedly parasitic.

COPERNICAN SYSTEM is a theory based upon the original hypothesis which Copernicus advanced to explain the relationship of planets in the solar system to one another (see COPERNICUS, NICOLAUS). This hypothesis correctly stated that the sun is the center of the solar system, with the earth and other planets revolving about it periodically in orbits. The theory discredited the Ptolemaic system (see PTOLEMAIC SYSTEM), which held that the earth was the center of the universe. It states that the planets, among them the earth, revolve about the sun in an orderly fashion, each in its own orbit; " . . . for who," says Copernicus, "in this most beautiful temple, could place the lamp in another or better place than that from which it can illuminate the whole?" The Copernican system was a logical explanation of observations that greatly simplified the study of astronomy and led to the development of astronomical laws. See KEPLER'S LAWS.

The Copernican system declared the earth to be a sphere that revolves about its axis once a day, while completing a circular orbit around the sun once a year. The rotation of the earth about its axis explains the rising and setting of celestial bodies, corresponding to day and night. The apparent motion of the sun among the stars is explained by the motions of the earth in its orbit about the sun. Likewise, the observed motion of the planets is caused by the combination of their motion around the sun and the motion of the earth, which accounts for the apparent eastward and westward motion of the planets. With these assumptions an observer can consider celestial

COPERNICUS

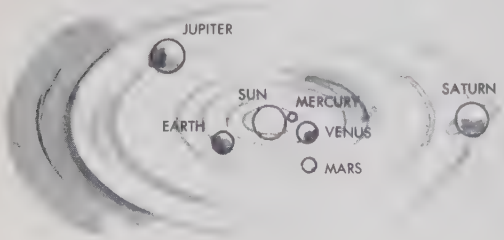


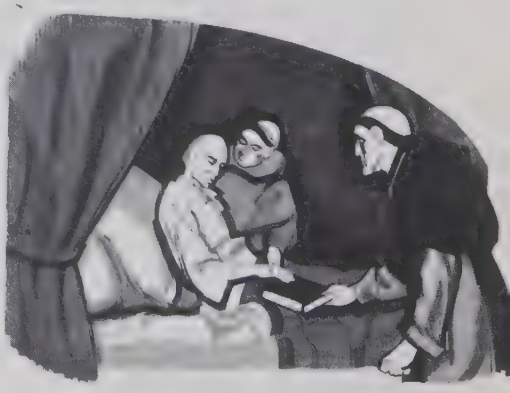


Copernicus, already trained in mathematics, varied his studies in canon law by attending astronomy lectures.

Still another field for the great astronomer was medicine. His skill as a physician was always ready to serve the needy even as he pursued other interests.

For centuries men thought that the earth was the center of the universe with sun, moon, planets, and stars moving around the earth in an orderly manner. Before Copernicus, men used the Ptolemaic theory of the universe to predict astronomical movements. This theory was made increasingly complicated to account for additional observations. Copernicus rejected the idea of an earth-centered universe and developed the hypothesis that the earth was only one of a number of planets moving in orbital paths around the sun. The Copernican hypothesis was later dignified and supported by Kepler's Laws and Galileo's invention of the telescope.





On his deathbed, Copernicus saw the first copy of the book propounding his revolutionary theory, developed 13 years earlier but long delayed in publication.

bodies as a daily panorama of scenery and the sphere of the stars can be imagined as being much larger than that in the Ptolemaic system.

The original Copernican theory was unnecessarily complicated because it included Ptolemy's epicycles to account for its inaccuracies. It was not until Kepler introduced the idea of the elliptical orbit and Galileo provided further proof by his pioneering work with the telescope that the Copernican system became the basic explanation of the universe. See ASTRONOMY; GALILEI, GALILEO.

COPERNICUS, NICOLAUS, 1473–1543, founder of the so-called Copernican system of astronomy which opened a new era in the study of celestial motion, was born in Torún, Poland. In 1491 he entered the University of Kraków, where the study of astronomy and mathematics was given precedence over other subjects, and in 1497 went to Bologna, where he studied canon law for three years. In 1500 he went to Rome, remaining there for a year as a teacher of mathematics. Returning home in 1501, Nicolaus accepted a post as canon of the cathedral at Frombork (Frauenburg). Almost at once he took a leave of absence and returned to Italy to study medicine and law at Padua; he returned to his native land in 1506 to assume his duties at the cathedral. Throughout these peregrinations, Nicolaus had continued the intensive astronomical investigations which had been his primary interest since his days at Kraków. In 1507 he began work on his great treatise, *De revolutionibus orbium coelestium*, which was completed in 1530.

In the preface to *De revolutionibus*, Copernicus avers that he was moved to seek a new theory of the universe because, in the light of the many inexplicable contradictions in existing theories, he was forced to conclude that something essential was lacking in them. He hoped to find the missing elements which would clarify what he considered to be a confused situation. See ARISTARCHUS OF SAMOS; COPERNICAN SYSTEM; PYTHAGORAS.

The Copernican conception of the solar system is heliocentric (sun-centered) as opposed to geocentric (earth-centered). Copernicus realized that there could be no concordance between *De revolutionibus* and the theories at that time considered acceptable by the church and, although he finished his book in 1530, he delayed publication for 13 years. His pupil Joachim Rheticus finally prevailed upon him to permit publication, and the first printed copy of the work reached the great astronomer as he lay on his deathbed. It is thought that he died unaware that a preface had been added to his own dedication of the book to Pope Paul III. This preface, written by Andreas Osiander, stated that the theses of the work were purely hypothetical, and that no blame should be attached to the author or to the printer (Osiander) of them; the implication was that Copernicus had proposed a revolutionary hypothesis which he himself believed false, and that the whole work was a mere geometrical exercise. Osiander no doubt hoped to preclude charges of heresy, but he also was partly responsible for the fact that the work was not taken seriously for many years.

Copernicus did not produce the complete system of astronomy which is often credited to him, but he did lay a cornerstone upon which later investigators, with infinitely more accurate instruments, could build. For this he has been regarded as one of the most creative and influential thinkers of all time. F. D.

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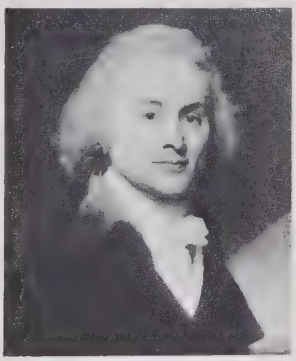
COPIAPÓ, town, N central Chile, capital of the province of Atacama and of the department of Copiapó, in the S Atacama Desert, on the Copiapó River, 410 miles NNE of Valparaíso. Copiapó is a mining, commercial, and railroad center. The town is located in the fertile irrigated valley of the Copiapó River with corn, hay, fruits, and vegetables the principal crops. Copiapó is principally noted for the production of copper, gold, and silver which are transported by railroad to the port of Caldera, 35 miles to the northwest. The town was founded by Pedro de Valdivia in 1540 and has been damaged repeatedly by earthquakes. Pop. (1952 est.) 19,535.

COPIAPÓ RIVER, N Chile, rises in the Andes Mountains in Atacama Province, follows a NW course to Copiapó, then flows W and empties into the Pacific Ocean; total length about 110 miles. The river marks the southern limit of the Atacama Desert. Irrigated crops are grown along its course.

COPLAND, AARON, 1900– , U.S. composer, was born in Brooklyn, N.Y. He studied composition with Rubin Goldmark in New York, and with Nadia Boulanger in Paris. Copland's early work attempted to adapt jazz techniques to highbrow music. In his later and more mature work the jazz influence was still present, but less prominently so. Copland set a highly individual melodic line against jazzlike rhythmic complexities and dissonant harmonies; this expressionist form had great influence on some of the younger U.S. composers. Apart from jazz, Copland made use of the folk and regional music of rural America, especially in such ballets as *Appalachian Spring* (1944) and *Billy the Kid* (1938), and his music for the motion pictures *Of Mice and Men* (1939) and *The Heiress* (1949). Copland's film scores are considered some of the best ever written. Among his more serious works are the Third Symphony (1946), Clarinet Concerto (1948), and 12 songs based on the poems of Emily Dickinson (1950). He wrote *Music and Imagination* (1952) and other books.

COPLEY, JOHN SINGLETON, 1738?–1815, British colonial painter, was born in Boston, Mass. He received some art training from his stepfather, Peter Pelham, an engraver; but as a painter he was largely self-taught. His earliest work now extant is a portrait of his half brother, Charles Pelham, painted in 1752. In 1766 his picture, *The Boy with the Flying Squirrel*, was exhibited in London and established his reputation in England. He married the socially prominent Susannah Farnum Clarke in 1769 and settled in Boston. During the winter of 1771–72 he traveled to New York, accumulating a large number of portrait assignments. Of his income at this time, he wrote, "I make as much money as if I were a Raphael or a Correggio." And his reputation in Boston was such that the square in front of the public library was named in his honor. However, the political and economic unrest prior to the revolution made Copley, who was a Loyalist, anxious for his family's safety. His father-in-law, Richard Clarke, was the merchant to whom had been consigned the tea which incited the Boston Tea Party; when Mr. Clarke complained that £15,000 worth of his merchandise had been dumped into the harbor, he was run out of town. This incident persuaded Copley that it would be well for him to go to England; he left America in 1774, and after a tour of Europe established himself in London, where his family joined him in 1775. Thus America lost her leading colonial portraitist.



BOSTON MUS. OF FINE ARTS
***John Quincy Adams* by Copley**

Copley's American work was direct, forceful, and realistic, with a straightforward objectivity illustrated in his *Epes Sargent, Sr.* (1760) and his *Mrs. Seymour*

Fort. He was the first major American painter to work with pastels, a technique used in his *Mary Storer* (1765). After settling in London he adapted his style to that of the eighteenth century English school, and used a more sophisticated technique which lacked the candidness of his earlier work. He was commissioned to paint the king and queen and was elected a full member of the Royal Academy in 1783. He also did portraits of many visiting Americans, among them John Quincy Adams, John Hancock, and Samuel Adams. The *Death of Lord Chatham* established his reputation as a historical painter. Copley's income from painting decreased greatly during his later years, and he was forced to accept financial aid from his son, John Singleton Copley, Jr. (later Lord Lyndhurst). He died of a paralytic stroke and was buried in Croyden Parish Churchyard.

COPPARD, ALFRED EDGAR, 1878– , English poet and short story writer, was born in Folkestone, Kent, and spent his early youth in great poverty. His formal education stopped at the age of nine, when he was apprenticed to a London tailor. In 1919 Coppard began to devote all his time to writing; his first book, *Adam and Eve and Pinch Me* (1921), was hailed as one of the more inventive works of twentieth century English fiction. His writing combined lyricism, lusty realism, sardonic wit, and subtlety of invention. His "Johnny Flynn" tales were spoken of as being in the Chaucerian tradition, and his poetry, such as *Cherry Ripe* (1935), gave evidence of his gift for lyric realism.

COPPÉE, FRANÇOIS ÉDOUARD JOACHIM, 1842–1908, French writer, was born in Paris. In his youth he was one of the "Parnassian" group of poets, and achieved prominence with the publication of *Le Reliquaire* (1867), a collection of poems. He was elected to the French Academy in 1884 and appointed an officer of the Legion of Honor in 1888. Coppée's work, craftsmanlike but uninspired, dealt with elementary human emotions, but only superficially: his main themes were pity for the poor and unfortunate, patriotism, the joys of love, and (in later works) religious fervor. *Le bon souffrance* (1898), one of his most popular efforts, was written after his reconversion to Catholicism. In his later years he was politically active and, as one of the organizers of the notorious Ligue de la Patrie Française, played an ignoble role in the Dreyfus case by taking a stand against the accused. He wrote several plays among which were *Le Luthier de Crémone* (1876), *Les Jacobites* (1885), and *Pour la couronne* (1895).

COPPENAME RIVER, central Surinam, rises in the Wilhelmina Mountains, flows N for 250 miles, and empties into the Atlantic Ocean about 50 miles W of Paramaribo. There is a natural waterway connecting it with the Nickerie River.

COPPER

Good conductor of electricity, this lustrous metal is useful in both home and industry.

COPPER, a metallic element known from ancient times for its valuable mechanical properties. When unalloyed with other metals it has a distinctive salmon-pink color with a bright metallic luster. Copper conducts electricity better than any other substance except silver; it also conducts heat well. It has high tensile strength, making it suitable for wires and cables, and is malleable and ductile. A fairly hard metal, it can be made even harder by alloying or by such mechanical procedures as rolling and working.

The chemical symbol for copper is Cu. Its atomic number is 29, its atomic weight 63.57. It has eight to 10 isotopes, of which only two are stable—Cu 63 (29 protons and 34 neutrons) and Cu 65 (29 protons and 36 neutrons). Copper melts at 1083°C and its boiling point under atmospheric pressure is 2325°C. Its density is 8.94 grams per cubic centimeter. See ELEMENT.

PAN AMERICAN UNION

An aerial view of the portal of the Vista Grande Tunnel, entrance to the Cananea copper mine in Sonora, Mexico, owned by one of the world's largest copper companies.

Because of copper's importance for modern industrial life as a conductor of electricity, certain international standards for its electrical conductivity have been established. Any impurities in copper lower its conductivity, some more than others. Arsenic is the worst offender; .04 per cent arsenic in copper lowers its conductivity by approximately 11 per cent. See CONDUCTION.

Uses. The electrical industry, which uses copper for transformers, power lines, motors and generators, switchboards, telegraph and telephone wires, and lighting, is the largest user of copper in the United States, taking from half to 60 per cent of the total. The building industry uses up to 15 per cent (for flashing, gutters, roofing, and piping) and the automotive industry up to 12 per cent. Other important uses are for radio and television sets, refrigerators, railroads, ships, ammunition, clocks and watches, heating equipment, air conditioning, and tools and machinery. These applications utilize such copper alloys as brass and bronze, as well as the pure metal for electrical and similar purposes. In munitions copper is used in cartridge cases, bullet jackets, and rotating bands and fuses for shells. Because copper is strongly resistant to corrosion and conducts heat well, it is widely used in heat exchangers, heating and cooling devices, water pipes, cooking utensils, water heaters, sterilizers, dairy machinery, and vacuum pans. Its resistance to corrosion and its distinctive color lead to many uses that require both ornament and utility, such as brass hardware, trim, bronze statuary, vases, and keys. Pure copper is rarely used for castings, but most of its alloys have excellent casting qualities. Copper is difficult to machine, and although its alloys are more readily machined, small amounts of another metal, such as lead, is usually added to improve machinability.

MINING AND PROCESSING

Ores. Copper occurs in various ores of world-wide distribution. Although it is native in the Lake Superior region of northern Michigan, most of the world's copper, however, is extracted from ores which contain the metal in combination, chiefly with sulfur and with iron and sulfur. Oxide, carbonate, and silicate ores are also found abundantly. The important sulfide ores include chalcocite or copper glance (Cu_2S), chalcopyrite or copper pyrite ($CuFeS_2$), bornite (Cu_5FeS_4), and covellite (CuS), known also as peacock ore. Sulfide ores occur abundantly in Montana, Arizona, Nevada, and Utah. Cuprite (Cu_2O), the red oxide, occurs in South America. Tenorite or melaconite (CuO), the black oxide, is found in Tennessee. Malachite ($CuCO_3 \cdot Cu(OH)_2$), a bright green copper mineral containing about 56 per cent copper, is found in large quantities in Arizona, Australia, and

Siberia. The blue ore azurite ($2CuCO_3 \cdot Cu(OH)_2$) is frequently found mixed with malachite. Other commercially valuable copper ores are the silicate, chrysocolla ($CuSiO_3 \cdot 2H_2O$); the sulfates, chalcanthite ($CuSO_4 \cdot 5H_2O$) and brochantite ($CuSO_4 \cdot 3Cu(OH)_2$); the basic chloride, atacamite ($Cu(OH)Cl \cdot Cu(OH)_2$); and the sulfides, enargite (Cu_3AsS_4), tetrahedrite ($4Cu_2S \cdot Sb_2S_3$), and fahlore, or gray copper, which contains copper combined with arsenic, antimony, and iron.

Copper Mining. In the upper reaches of Lake Superior quantities of native copper occur. These deposits fill the vesicular openings of ancient lava flows and abound in surface traps or along the clay banks of streams. The mining of copper ore in this area is adaptable to the simplest methods of extraction; great power shovels capable of removing eight to nine tons of ore in one sweep carry through a systematic process of strip or open-cut mining that is remarkable for its economy. Careful engineering assures the prevention of slides and, as the workings become larger, greater masses of machinery and men can operate. Railroads lead directly from the area to the ore boats that shuttle through the locks of Sault Ste. Marie. See MINING.

Deposits of copper in other areas vary in composition throughout the nation. Sulfide copper ores, most important economically, are invariably contaminated with arsenic and antimony. Large quantities of silver and gold are recovered in extracting and refining the copper, and this has helped to maintain the production of such older workings as those at Butte, Mont., and Bisbee, Ariz. The Butte ores are typical vein deposits formed by hot waters. Ores at the Bisbee, Globe, Clifton, and Morenci areas in Arizona represent typical replacement deposits in limestone. Other areas, as in Utah, possess enormous bodies of low-grade ore disseminated in porphyry. The Globe, Miami, and Ray districts of Arizona contain great disseminated deposits in Pre-Cambrian schists. (See MINERALOGY.) Mining of these ores can be carried on profitably at great depths. Stoping and timbering can be held to a minimum because of the natural strength of the subsurface structure. Smelting is done close to the mines in order to save transportation costs.

Extraction of Copper. The various copper minerals occur in nature disseminated in valueless rocky or earthy material known as gangue. The first step in extracting copper is to crush and grind the ore to release the mineral particles from most of the gangue. The ore is next concentrated by removing some of the gangue to raise its copper percentage from about 1 per cent to as much as 40 per cent. Sulfide copper ores, which are the most common type, are successfully concentrated by the flotation process. In this method, the finely ground ore is agitated with water and air, with a little pine oil or creosote and an organic collecting agent being added. Air bubbles become attached to the mineral particles in a stable froth which forms and rises to the top of the flotation cell, while the particles of gangue sink to the bottom.

A three-boom "jumbo" drill cuts into the ore face at an Anaconda Company mine, Butte, Mont., before blasting. Ore is then loaded into cars and hauled to the surface.
THE ANACONDA CO.

The concentrated ore can then be roasted in a furnace to remove a large part of the sulfur by oxidizing it into sulfur dioxide, which passes off as a gas. The remaining sulfur is left to combine with the copper and iron to form copper matte, a mixture of copper and iron sulfides formed in a molten state by smelting in the furnace. The remaining gangue and other impurities are removed in a slag, which is formed by the addition of iron ore and usually some limestone as fluxes. (See SLAG.) The matte, while still in a molten state, is transferred to a converter. Here air is blown into the matte, oxidizing the iron and sulfur and leaving the copper in a form known as blister copper. Escaping gases form blisters on the surface as the copper solidifies. The blister copper, which still contains 1 to 2 per cent impurities, is then placed in a refining furnace where the remaining sulfur and other impurities, such as arsenic, antimony, iron, and nickel, are largely removed. From this furnace the copper, with its purity increased to about 99.3 per cent, is cast into slabs for electrolytic refining.

The slabs, weighing as much as 700 pounds each, are suspended as the anodes in an electrolyte of copper sulfate acidified with sulfuric acid, alternating with thin sheets of pure copper which serve as cathodes. (See ELECTROLYSIS.) When the electric current is flowing, pure copper deposits are formed on the cathodes from the electrolyte while copper is dissolved from the anodes in maintaining the copper balance of the solution. Thus, the cathodes are built up of copper 99.98 per cent pure. Impurities which are less active chemically than copper, notably gold and silver, do not dissolve from the anode but fall to the bottom of the tank where they are recovered as a valuable by-product. The more active impurities, such as nickel, arsenic, and iron, dissolve along with the copper but do not deposit on the cathodes. They build up in the electrolyte, which must therefore be continuously withdrawn and purified. The pure cathodes are remelted in another furnace and cast into shapes for manufacture into wire, sheets, tubes, and other products.

Copper ores may also be treated for extraction of copper by leaching with sulfuric acid or other solvent. In this method the ore does not need the initial concentration. A sulfate solution is obtained from which pure copper may be deposited electrolytically in a manner similar to electrolytic refining. The copper also may be precipitated from this solution by means of scrap iron. Leaching, an old process known as hydrometallurgy, has made little progress since the advent of flotation.

Copper Alloys. Nearly all of the principal metals can be combined with copper to form alloys. Among them are zinc, tin, lead, nickel, aluminum, manganese, iron, cobalt, and beryllium. (See ALLOY.) Copper forms more useful alloys than any other metal with the possible exception of iron. There are over 1100 varieties of copper alloys in use today, the two most important of which are brass and bronze. Brass is essentially an alloy of copper and zinc but one or more additional elements are often added to form special varieties. Bronze was originally an alloy composed of copper and tin, but many varieties of bronze have been developed. Other elements may be incorporated in addition to tin, or the tin may be replaced by one or more other metals. See BRASS; BRONZE.

Copper alloys generally are harder and stronger, have better casting qualities, and are more easily machined than pure copper, but their abilities to conduct electricity and heat are much inferior. Some alloys such as common brass are inferior in resistance to corrosion, while others are as good as or better than copper in this respect. The same holds true for qualities of malleability and ductility. In general, however, the alloys rank high in corrosion resistance, malleability, and ductility.

Another useful copper alloy is cupronickel, composed of 70 to 80 per cent copper and 20 to 30 per cent nickel. A 75-25 combination is used to make the United States five-cent piece, the nickel causing the metal to lose its copperish color. Constantan, a copper alloy containing 45 per cent nickel, is notable for its high electrical resistance which is maintained through a wide range of temperatures. Gun metal and bell metal are types of binary copper-tin bronzes with a high tin content. Many of the copper alloys are used almost entirely in cast form, while others are used mainly in wrought form since certain compositions yield superior casting properties and others are most adaptable for working.

Copper is a minor constituent of many alloys of which the major component is some other metal. Among the most important of these are the aluminum alloys of the Duralumin type (about 4 per cent copper) and a number of aluminum casting alloys. Monel metal, a nickel alloy (about 30 per cent copper) with a little iron and manganese, is used for purposes requiring strength and good appearance; it is highly corrosion resistant and ductile. Silver and gold, when used for coinage, jewelry, and other purposes involving wear, are usually hardened by adding up to 10 per cent copper. Copper is also used in some alloy steels. See Aluminum; Minting; Monel Metal.

Copper Compounds. Copper is not very active chemically and is not affected by dry air at ordinary temperatures, but in the presence of moisture and of carbon dioxide it acquires a green coating of basic carbonate, $CuCO_3 \cdot Cu(OH)_2$. Copper has a valence of +1 and +2 and an unstable state of +3, and forms two series of compounds, cuprous and cupric. These compounds are soluble in water, possess a disagreeable metallic taste, and are poisonous. Copper is below hydrogen in the activity series of the metals and is practically unaffected by dilute hydrochloric or dilute sulfuric acids at ordinary temperatures. Hot concentrated sulfuric acid acts on copper, forming cupric sulfate, water, and sulfur dioxide:

$$Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + SO_2$$

Dilute nitric acid reacts with copper, forming cupric nitrate, water, and nitric oxide:

$$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 4H_2O + 2NO$$

When concentrated nitric acid acts on copper, nitrogen dioxide gas is formed:

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$$

Copper forms two important oxides. *Cuprous oxide*, Cu_2O, is a red powder which is formed by reducing Fehling's solution with glucose. It is employed in making ruby glass and in coloring porcelain. *Cupric oxide*, CuO, is a black powder which forms when copper is heated in air. It may also be obtained by gently heating cupric nitrate, cupric carbonate, or cupric hydroxide. Cupric oxide is used for producing a light green color in glass. Cu_2O and CuO react with acids to form salts of copper. The best known of the cupric salts is blue vitriol, *hydrated cupric sulfate*, $CuSO_4 \cdot 5H_2O$, a crystalline solid which becomes a white powder when dehydrated by heat. It is used in calico printing, dyeing, electroplating, preparation of pigments, preservation of timber, and in making Bordeaux mixture, an important fungicide for grapevines, shrubs, and trees. Basic cupric carbonate, $CuCO_3 \cdot Cu(OH)_2$, is a green powder which is used in making pigments. Cupric hydroxide, $Cu(OH)_2$, a light blue compound, is insoluble in water, but dissolves in ammonium hydroxide to form a deep blue solution, $Cu(NH_3)_4^{++}$, which is used for dissolving cellulose in making rayon. Cupric chloride, $CuCl_2 \cdot 2H_2O$, is a green, crystalline, soluble solid obtained by the action of hydrochloric acid on cupric oxide or cupric carbonate. It is used in the dyeing and printing of fabrics. Cuprous chloride, CuCl, is a white, insoluble, crystalline solid which forms when copper is heated in hydrogen chloride. It dissolves in hydrochloric acid, forming a solution which absorbs carbon monoxide and acetylene. This solution is used in gas analysis. Cupric nitrate, $Cu(NO_3)_2 \cdot 3H_2O$, a blue, deliquescent, crystalline solid, is used in dyeing and calico printing as an oxidizing agent.

All cupric salt solutions are blue in color, due to the presence of cupric ions. When ammonium hydroxide is added to a cupric salt solution, a deep blue coloration results, due to the formation of the cupric ammonium ion, $Cu(NH_3)_4^{++}$. The reaction of cupric ions with potassium ferrocyanide solution to form a reddish brown precipitate of cupric ferrocyanide provides a very delicate test for detecting the presence of as little as 1 part of copper in 500,000 parts of water. Cupric salt solutions react with hydrogen sulfide to form a black precipitate of cupric sulfide which is insoluble in hydrochloric acid.

Economic Aspects

Copper provided the raw material for one of America's first highly concentrated industrial areas—the great brass rolling mills of the Naugatuck River in Connecticut. For almost a century, nearly half the total copper produced in America was sent to this region for processing into brass.

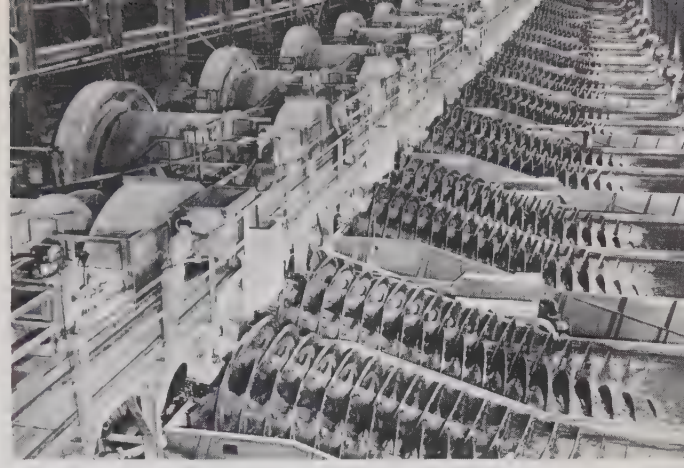
The first copper mine worked in the United States was the Simsbury mine at Branby, Conn., opened in 1705. The Gap mine in Lancaster, Pa., was opened in 1732. The United States depended upon imports from Chile until 1844, when the Cliff mine located on the Eagle River, Michigan, opened up the vast Lake Superior ore region. Subsequently, extensive copper ore findings were made in the region of Butte, Mont., and in Arizona, Utah, Nevada, and New Mexico.

The concentration of fabricating plants using copper at first was occasioned by the availability of cheap water power in New England. The general advent of steam, and later of electrical power, did much to disperse the copper, and brass industries. At the same time, the greater availability of domestic copper supplies turned the United States from an importer to an exporter of copper about 1880. The export balance continued until 1940, when the greatly increased demand for copper for defense purposes again made the United States a copper-importing nation. After World War II, imports continued to rise.

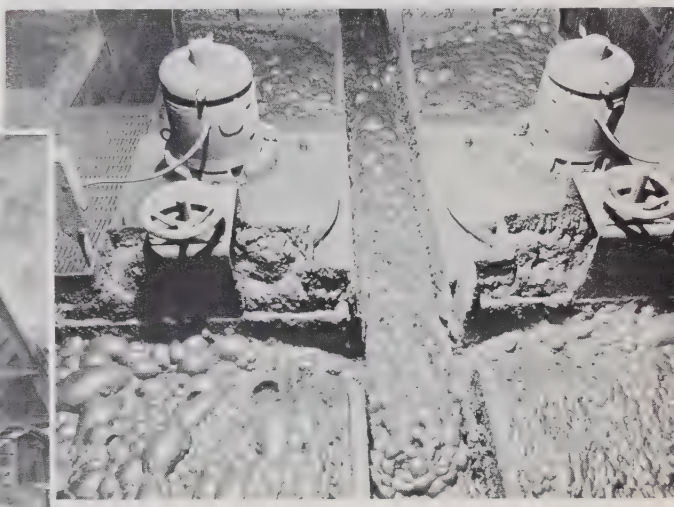
From 1935 to 1955, the average copper content of ores mined declined from a little over 2 per cent to about .9 per cent. The cost of production rose steadily because of the necessity of mining and treating more than twice as much ore to recover the same amount of copper as in the past. The price of copper was about 16 cents per pound in 1901. Just before World War I, it was 15 cents, rising to 27 cents in 1917, and falling again to the incredible low of 4¾ cents in 1933. By 1939 the price had recovered to 11 cents, and after World War II it rose rapidly to nearly 30 cents in 1953 and 46 cents in 1956. Despite increased competition from aluminum and other metals, the total consumption of the red metal continued to rise despite high prices.

Aluminum long has been a possible substitute for copper as a conductor of electricity. Although the electrical conductivity of aluminum is only 61 per cent of that of copper on a volume basis, aluminum has twice the conductance of copper on a pound-for-pound basis because it is so much lighter in weight. Even before World War I, aluminum was sometimes used instead of copper for power transmission cables and wires, especially in Europe, although it was twice

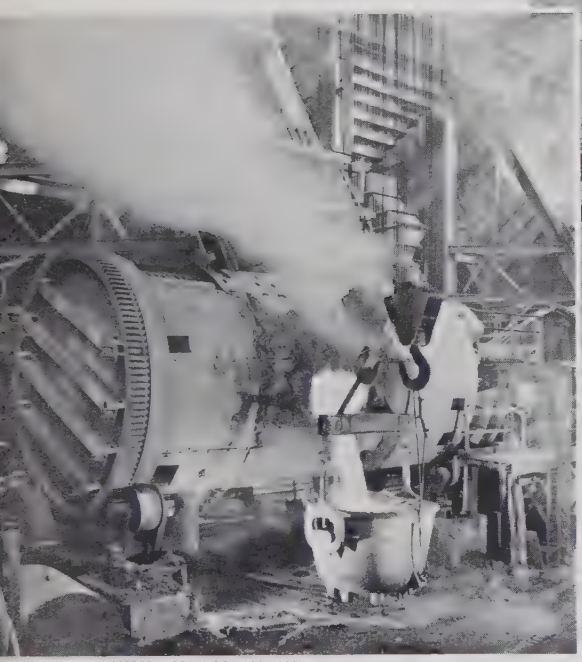
COPPER



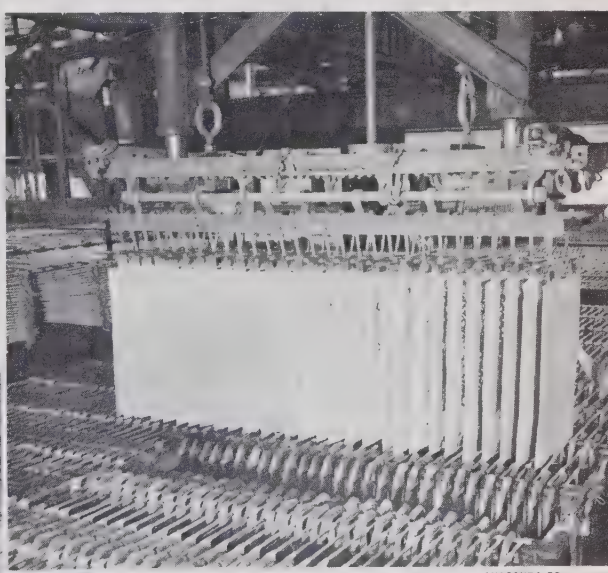
Copper ores, after being well crushed in ball mills, right, are concentrated by removing a large part of the gangue.
U.S. BUR. OF MINES



In the flotation machines, right, oily bubbles remove the fine particles of copper from the finely pulverized ore.
LIB. OF CONGRESS



COPPER & BRASS RESEARCH ASSN.
Molten copper is poured from a converter into a ladle; it is then transferred to a refining furnace to remove impurities.



ANACONDA CO.
Cathodes of pure copper are hoisted from the electrolytic refining tank, leaving the impurities on the bottom as sludge.

Newly drawn copper wire is readied for further drawing to proper size and is then insulated for electrical purposes.
U.S. RUBBER CO.

THE ANACONDA CO.

This 178-foot steel headframe, operating two 12-ton skips in counterbalance, is capable of hoisting 15,000 tons of ore daily at Anaconda's Kelley Mine, near Butte, Mont.

as costly as copper. With the increasing cost of copper this substitution gained impetus. Aluminum is now often substituted for brass (and therefore indirectly for copper) in many applications. Nevertheless the total demand for copper has increased rather than declined.

U.S. Production. As in every other basic industry, the copper industry during World War II reached record heights of output, in spite of the already apparent depletion of some of the older mining areas. Smelter production of copper in the United States in 1938 was 562,328 tons; five years later this production totaled 1,092,939 tons. In 1945 production had dropped to 783,000 tons, but by 1947 again had risen above 1 million tons. Total output in 1954 was 1,068,000 tons.

The principal copper areas in the United States are, in order of importance: the Bingham district of Utah and Nevada; the Morenci (Copper Mountain) district of Arizona; the central region of New Mexico; the Butte district, Montana; the Ajo region, Arizona; the Ely area, Nevada; Lake Superior district; and the Bisbee district, Arizona. Since 1900 the Bingham district has held its position as leader among the main copper areas in the United States. The ores found in this region are chiefly sulfides. The principal ores found in the Butte district are chalcocite, chalcopyrite, enargite, and bornite. The extensive works of the Anaconda Company are located in this district. The mining of copper in the Lake Superior region antedates the earliest visits of European explorers; commercial production dates from 1845. The native copper occurs in masses ranging from particles of microscopic size to bodies weighing many tons.

Arizona leads all other states in production of copper, supplying about 45 per cent of the annual U.S. total. Utah is the second ranking producer, most of its output coming from the largest copper-producing mine in the country, operated by the Kennecott Copper Corporation. Nevada, New Mexico, Montana, and Michigan rank after Arizona and Utah in production of copper. These six states together produced over 95 per cent of the total U.S. output in 1954. In addition to newly mined copper there is a large output of secondary copper derived from scrap. In 1954 this included old scrap amounting to 422,000 tons and new scrap from manufacturing operations amounting to 425,000 tons. Thus scrap copper, which includes copper contained in scrap brass, bronze, and other alloys, totaled about 90 per cent as much as the production of primary copper in the United States.

World Production. Total world production of new copper was 3.2 million tons in 1955. The highest output during World War II was 3.1 million tons in 1942, but after the war it fell to a low of 2.1 million tons in 1946, only to recover thereafter.

The leading copper-producing countries after the United States were Northern Rhodesia, Chile, Russia, Canada, and Belgian Congo. These six countries account for more than 80 per cent of the world's production. Large copper deposits in North America and continued advances in mining and processing techniques indicate that North America, and especially the United States, will remain in a leading position among world producers. New copper mines, or extensions of previously known deposits, have been opened up in recent years to more than offset the decline in grade of ores obtained from the older producing mines. See ELECTRICAL EQUIPMENT INDUSTRY; METAL.

ALLISON BUTTS

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COPPER CLIFF, town, S Canada, in the province of Ontario, on the Canadian Pacific Railroad and Ontario provincial highway 17; 4 miles WSW of Sudbury and 200 miles NNW of Toronto. The chief industries of Copper Cliff are nickel mining and smelting, and copper refining. Pop. (1951) 3974.

COPPERHEAD, a member of that group in the northern states which was opposed to the Civil War, or one who sympathized with that group. Such persons received the name from the copperhead snake, which strikes without warning. Feelings were high during wartime, and shades of opinion many. Some persons, probably few in numbers, were active, if secret, supporters of the Confederacy. They conveyed information and were prepared to aid with arms if opportunity offered. Others hampered the war effort in the North by discouraging enlistments, helping or hiding draft evaders and deserters, and by circulating Confederate propaganda. Such groups were known to exist especially in the Northwest, though their power was often exaggerated. One reported effort to free Confederate prisoners of war failed, and Confederate invasion attempts received little support. Many men, on the other hand, were critical of the policies and administration of the government, or of the objectives of the Radical Republicans, either on principle or as partisan Democrats, without aiding or abetting the enemy. In the heightened temper of civil strife, however, it was not easy to distinguish the loyal from the disloyal opposition, nor did vigorous supporters of the administration always try to do so. To them, any opposition or criticism was the work of a Copperhead. See KNIGHTS OF THE GOLDEN CIRCLE; DRAFT RIOTS; CIVIL WAR, AMERICAN.

U.S. FISH AND WILDLIFE SERVICE

Although the copperhead is as poisonous as the rattler, its bite is usually somewhat less dangerous because of the shorter fangs. It will rarely attack man unless cornered.

COPPERHEAD is a poisonous, but rarely deadly, North American snake belonging to the pit viper family *Crotalidae*, which also includes the rattlesnakes and moccasins. Four subspecies of copperheads, *Agkistrodon contortrix*, are recognized. They

range from the eastern states to Texas and Oklahoma. In northern ranges they inhabit rocky areas near swamps and heavy timber; in the South they are usually found in dry places. Copperheads usually try to avoid humans and bite only when alarmed. The fangs of the copperhead (see FANG) are hollow, permitting the snake to inject venom into its victim. Although the copperhead's bite is dangerous, it is generally not fatal. Quicker than the rattlesnake, the copperhead is about 3 feet in length, with a head about 1½ inches wide. The body is brownish with copper-colored markings. The pupil of the eye is elliptical and the forked tongue is white at the ends and red at the base. The female gives birth to two to ten young, depending upon the subspecies. Copperheads feed upon small mammals, frogs, salamanders, birds, and other snakes.

COPPERMINE, town, N Canada, in the Northwest Territories, District of Mackenzie, on Coronation Gulf at the mouth of the Coppermine River, 700 miles ENE of Dawson, Yukon. Coppermine is the site of a meteorological and radio station, trading depot, and Royal Canadian Mounted Police post. The town contains missions and mission schools for the predominantly Eskimo population of the area. Pop. (1951) 655.

COPPERMINE RIVER, NW Canada, Northwest Territories, rises in a lake region in the central Mackenzie District, flows generally NNW through its course of 525 miles; empties into Coronation Gulf about 40 miles SW of Dolphin and Union Strait. The river, which contains native copper deposits, was discovered by Samuel Hearne in 1771.

COPPER RANGE. See KEWEENAW PENINSULA.

COPPER RIVER, S Alaska, rises in the Wrangell Mountains, flows in a southerly direction for its entire course of about 300 miles, and empties into the Gulf of Alaska, an inlet of the Pacific Ocean. Copper deposits are found near its upper course.

COPPERSMITH is one of the more than 70 species of birds known as barbets. See BARBET.

COPPET, village, SW Switzerland, in the canton of Vaud, on the W shore of Lake Geneva, about 8 miles N of Geneva. Coppet is noted for the château made famous by Jacques Necker, French financier, and his daughter, Madame de Staël. Pop. about 500.

COPRA is the dried meat of the coconut (see COCONUT). Important as the source of coconut oil, it is prepared by husking and splitting the coconut, extracting the meat, and drying it in the sun over slow fires, or in hot air chambers or rotary driers. Properly dried, copra is white in color, has a sharp, brittle fracture, and yields a clear, white, smooth oil. Coconut oil is used in the manufacture of soap, candy, and edible fats. It is also used as an ointment base and in the manufacture of candles.

COPROLITE is the fossilized excrement of various animals. Fish coprolites, for example, are important because they often contain portions of scales, bone, teeth, and shells, the indigestible parts of the food on which the animals lived. Occasionally coprolites may be found exhibiting twisting and other marks that were produced by conformation of the intestinal tube, such as are noticed in the excrement of some living fishes. Coprolites contain a large proportion of phosphate of lime and when obtainable in large quantities are of value in the preparation of fertilizer.

COPT, an Egyptian Christian of the Monophysite faith or of Monophysite origin. The Coptic church was once very strong in Egypt. The break with the Roman Catholic church came in 451 when the Copts and other Monophysites refused to accept the decree of the Council of Chalcedon defining the dual nature (human and divine) of Christ. The Monophysites held that Christ had but one composite nature. The resulting division in Egypt contributed to the Moslem conquest in 642. The Copts now number about 6 per cent of the Egyptian population. In 1947 there were 1,186,353 Orthodox Copts, 86,918 Protestant Copts, and 72,764 Roman Catholic Copts (who use the Coptic language and rite), not including several small Christian groups of non-Coptic origin.

There are many Copts in Cairo and Alexandria and in Upper Egypt. Many of them belong to the professional and business classes and are wealthy and influential. Racially the Copts closely resemble their Moslem neighbors. The Coptic language has become extinct but is still used in the church ritual, although the Arabic is used in part of the service; the Coptic literature is wholly religious. The church is headed by a patriarch, whose succession has been unbroken since the schism. The church accepts seven sacraments, and in most respects resembles the Orthodox Eastern church. The Egyptian Coptic church has close relations with the Ethiopian church, which is also Monophysite. See MONOPHYSITE.

COPTIS. See GOLDTHREAD.

COPTOS or Koptos, also Qûs, Qift, or Kuft, village, upper Egypt, on the E bank of the Nile River, 18 miles NNE of Luxor. Several trading routes started here and the city became important as a commercial center during the rule of the Ptolemies, after the third century B.C. It was the terminal for a caravan route to the port of Berenice on the Red Sea. The journey across the Arabian Desert took about five days. In the rebellion against Diocletian, 292, it was practically destroyed. Later it was rebuilt but did not regain its former importance. Pop. about 9000.

COPYHOLD, a peculiar form of landholding in England derived from the villein tenure of the Middle Ages, and a lesser estate than freehold (see TENURE). The term signifies that the lands are held by copy of the court roll of the manor, this being evidence of the right to possess (see MANORIAL SYSTEM). Originally the tenant in villeinage held his land solely at the pleasure of the lord of the manor, but in course of time customs grew up which were recognized and enforced by the royal courts. These customs allowed the tenant an ever increasing security of possession, but regulated the conditions of alienation, line of descent, and so on. Hence the custom of the manor took the place of the lord's will.

The disadvantages of this antiquated form of landholding have led the British parliament to pass a number of acts for the "enfranchisement" of copyholds—that is, the conversion of them into freeholds. All copyhold land was thus eventually enfranchised. No land is held by this type of tenure in the United States. See ENCLOSURE MOVEMENT; ESTATE; FEUDAL SOCIETY.

COPYRIGHT, the exclusive right of printing, publishing, or selling copies of a literary or musical composition, or of producing or reproducing a dramatic or artistic work. While this right is usually referred to the statutes known as Copyright Acts in the United States and other countries, it is in reality founded on common law rules of great antiquity. Thus the writer of a letter or other manuscript, or the author of a drawing, speech, or play, is protected both in law and equity against the unauthorized publication of his work. He has well defined rights of property in the form and style of his composition which are invaded by any unauthorized use. Under common law, however, such rights cease upon publication, and it is at this point that copyright legislation is necessary to extend to the author the same protection for a limited term after publication that the common law had given him before.

United States. Section 8, Article 1, of the U.S. Constitution grants Congress the authority "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

The present copyright law was enacted March 4, 1909, and amended by numerous acts since then. It was codified and enacted into positive law by the Act of July 30, 1947. The law secures to persons com-

plying with its provisions "the exclusive right to print, reprint, publish, copyright, and vend the copyrighted work." The same exclusive control is secured for translations, for the dramatization of a work of literature, for converting into literary form the material of a drama, for the arrangement or adaptation of a musical composition, and for the execution and reproduction of a work of art. A similar copyright control is given for the text of a lecture, sermon, or address; for the performance or representation of a dramatic work; and for the matter of a musical composition. In the case of a musical composition, however, the "exclusive control" is subject to the following restriction: Whenever the owner of such copyright has authorized the production of the composition "upon the parts of instruments serving to reproduce the same mechanically," any other person is at liberty to make "similar use of such copyrighted work upon the payment to the copyright proprietor of a royalty of two cents on each such part manufactured."

The articles on which copyright can be claimed include books—composite and cyclopedic works, directories, gazetteers, and other compilations; periodicals, including newspapers; lectures, sermons, and addresses, prepared for oral delivery; dramatic or dramatico-musical compositions; musical compositions; maps; works of art, models, or designs for works of art; reproductions of a work of art; drawings or plastic works of a scientific or technical character; photographs; prints and pictorial illustrations; motion picture photoplays; motion pictures other than photoplays; and any writings of an author not included in this list.

The original term of copyright is 28 years from the date of the first publication. Provision is made, however, for extension of the copyright for a second term of 28 years. Such extension can be secured not only by the author, but also upon application by his widow (or her widower), or children, or by his executor, his next of kin, or by the proprietor in case a certain work is copyrighted by a proprietor, corporation or employer, if it is a composite work upon which copyright was originally secured by the present proprietor.

The control of copyrighted productions secured for citizens or residents of the United States is extended to the citizens of any state which grants "reciprocal privileges to the citizens of the United States." The United States has made reciprocal copyright agreements with all important countries except Bulgaria, Egypt, Ethiopia, Yugoslavia, Latvia, Lichtenstein, Lithuania, Persia, Russia, Turkey, and Venezuela. Since World War II has affected the status of various countries, it is uncertain as to what protection, if any, is extended to copyrighted property in such areas, or to what extent prior engagements with regard thereto will be recognized.

Procedure. The first step in securing a copyright on works intended for sale or public demonstration is the publication of the work to be copyrighted, with the copyright notice in the prescribed form and place. Immediately after publication two copies (or if the work is by a foreign citizen and first published in a foreign country, one copy) of the best edition must be forwarded to the Copyright Office, Library of Congress, with an application for registration, which is made under regulations issued by the Register of Copyrights, subject to the approval of the Librarian of Congress. Special provision is made for the deposit of works not reproduced in copies for sale. A fee of four dollars is required for the registration of any work, including unpublished works. The fee for registering commercial prints and labels is six dollars.

Printed books and periodicals, except the original text of a book of foreign origin in a language or languages other than English, must be "printed from type set within the limits of the United States. . . . or by a process wholly performed within the limits of the United States, and the printing of the text and binding of the said book shall be performed within the limits of the United States." This requirement extends also, in general, to illustrations and to separate lithographs or photoengravings. A notice of copyright, as prescribed by the copyright law must be affixed to each published copy of the work protected by the copyright and offered for sale. In books this must appear either on the title page or the page immediately following.

In the case of a book published abroad in the English language before publication in this country, the deposit in the copyright office, not later than six months after publication abroad, of one complete copy of the foreign edition, with a request for the reservation of the copyright, secures the author or proprietor an ad interim copyright effective for five years. Upon the publication of the book in the United States under the manufacturing provisions specified by the act and the deposit of copies, the copyright is extended to the full term.

Infringement. A copyright is infringed by any unauthorized publication, reproduction, or sale of the copyrighted matter. The courts have held that not only the reproduction of the exact words or phrases in the original work, but the reproduction in substance of its plot, scheme, or arrangement, constitutes an infringement. An author cannot, however, secure control under copyright for facts or information collected by him; these facts may be utilized by another without authorization if the reproduction is presented in some new form of arrangement. The same statement is true in regard to ideas, which can be protected only in the literary form in which they have originally been presented in the copyrighted work. There is under the United States statute no copyright in a title; but the courts have held that a title which, in connection with the continued sale of a work, has secured a "good will commercial value" shall not be interfered with. It has also been held that there shall be no "colorable imitation" in the wording of a title, or in the form of mechanical presentation, of any copyrighted work, by a competing work of similar character.

Under the present law the author whose work has been infringed is placed in a position to secure an injunction restraining any continued infringement. When the infringement has been proved, he can secure under an action at law the damages which shall be shown to have accrued; or in lieu of damages the court may in its discretion allow a specific amount, not to be less than $250 nor to exceed $5000; in the case of a newspaper reproduction of a copyrighted photograph, the appraisal is $50–$200.

Great Britain. The present British copyright law was enacted in 1911, and extends throughout the British possessions except the self-governing dominions. It applies to every original literary, musical, and artistic work, and the rights protected by it include lectures, translations, performing rights, the conversion of dramas into novels and of novels into dramas, and mechanical reproduction by records and cinematograph films. The duration of this monopoly, in the case of works published in the lifetime of the author, is for the term of the author's life, and, with certain restrictions, fifty years beyond. No registration is required, but a copy of every book published must be deposited in the British Museum within a month after publication. It is interesting to note that under the Copyright Act of 1911, the universities have a right to demand a free copy of every book published.

The privileges of the act apply to all persons who at the date of the making of the work to be copyrighted were British subjects or residents domiciled within the parts of British dominions included by the act, or who were under protection through international provisions. Under the provisions of Section 28 of the Act of 1911, protection has been extended to many of the British colonies, protectorates, and mandates. Both India and the Irish Free State have acts which are modifications of the Act of 1911.

Canada. The Canadian copyright privilege is extended to any person who is, at the date of the making of the copyrighted work, a British subject, a citizen or subject of a foreign country adhering to the International Convention, or resident within the Commonwealth. With certain exceptions (photographs, records, and so on) the copyright period is the life of the author and a period of fifty years after his death. The copyright fee is two dollars for registration and one dollar for a certificate of registration. By virtue of an agreement dated December 27, 1923, citizens of the United States receive the privileges of the Canadian copyright law.

International Copyright. In 1886 a convention held in Bern, Switzerland, in which nearly all the states of Europe were represented, adopted a series of regulations providing for reciprocity among the nations in copyright relations, so that the works of the citizen of any one state should secure protection throughout the territory of all the states which accepted the convention. The countries originally adhering to the convention include Great Britain, Germany, Belgium, Spain, France, Haiti, Italy, Switzerland, and Tunisia. The Bern convention was revised in minor details in 1896 and again in 1908, and in 1928 (June 2) a new convention was drawn up to replace it, subject to ratification, not later than 1931.

Although the United States is not a member of the Copyright Union, through the copyright relations established between the United States and Great Britain works originating in the United States can secure protection throughout the territory covered by the Bern regulations, if they are brought into print in Great Britain not later than the date of publication elsewhere. At the outbreak of World War II, the members of the Copyright Union were: Austria, Belgium, Brazil, Bulgaria, Czechoslovakia, Danzig, Denmark, Estonia, Finland, France (including Algeria and other colonies, and Syria and Lebanon), Germany, Great Britain (including her colonies and possessions, the self-governing dominions being individual members), Greece, Haiti, Hungary, Eire, Italy, Japan, Yugoslavia, Latvia, Lichtenstein, Luxembourg, Morocco (including the Spanish zone), Monaco, the Netherlands and possessions, Norway, Poland, Portugal, Rumania, Siam, Spain, Sweden, Switzerland, Tunisia, and Turkey.

In September 1952 a Universal Copyright Convention was signed at an international conference in Geneva under the sponsorship of UNESCO, and came into effect on Sept. 16, 1955. By the end of 1955 the convention was ratified by 16 countries: Andorra, Cambodia, Pakistan, Laos, Haiti, Spain, the United States, Costa Rica, Chile, Israel, the German Federal Republic, Monaco, The Vatican, Luxembourg, Philippines, and France. The convention did not affect the relationships among the countries of the Copyright Union, nor the rights and obligations of the parties to the Pan American Copyright conventions.

Four Pan American conventions have been drawn up: that of Mexico City (1902) effective as between the United States, Costa Rica, Guatemala, Honduras, Nicaragua, and Salvador; that of Rio de Janeiro (1906), which was not ratified by the United States, and which never became effective; that of Buenos Aires (1910, ratified 1914) effective as between the United States, Bolivia, Brazil, Costa Rica, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Nicaragua, Panama, Paraguay, and Uruguay; and that of Washington (1946) in a conference at which the following countries were represented: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, United States, Uruguay, and Venezuela.

COQUES or **COCX, GONZALES,** 1614–84, Flemish portrait painter, was born in Antwerp. A pupil of Pieter Brueghel III, an obscure portraitist, Coques was so imitative of Van Dyck in style that he was called "the little Van Dyck." Most of his work was executed for the English court. His portraits include *David Teniers, The Prince of Orange and His Family,* and *The Archduke Leopold.*

COQUILHATVILLE, town, W Belgian Congo, capital of the province of Equator, at the confluence of the Congo and Ruki rivers, 360 miles NNE of Léopoldville. Coquilhatville is a commercial center and river port important for its trade in copal. Industries in the town include printing, fishing, boatbuilding, and the manufacture of pharmaceutical chemicals and food products. Coquilhatville contains hospitals, schools, Christian missions, and an airport. At Eala, on the eastern outskirts of Coquilhatville, is an agricultural research station and botanic garden. The town was founded in 1883 by Sir Henry Morton Stanley. Pop. (1952 est.) 11,192.

COQUILHATVILLE, province. See EQUATOR.

COQUILLA, a species of palm that is one of the best known commercial plants of Brazil. Also called pissaba palm, the coquilla, *Attalea funifera,* may grow to a height of 30 feet. Its fruit, a nut from 3 to 4 inches in length, is used by cabinetmakers because of its hardness and beautiful finish. The chocolate-colored fiber is used in making brooms and rope.

COQUILLE, city, SW Oregon, county seat of Coos County, on the Coquille River, near the Pacific Ocean; on the Southern Pacific Railroad and U.S. Highway 101; 84 miles SW of Eugene. The chief industries of Coquille include logging, lumber and plywood milling, and dairying. Sheep and poultry are raised in the vicinity. Pop. (1950) 3523.

COQUIMBO, province, N central Chile, bounded by the Pacific Ocean on the W, Argentina on the E, and by the provinces of Atacama on the N and Aconcagua on the S; area 15,401 sq. mi.; pop. (1952) 262,067. The province is largely mountainous and peaks of more than 18,000 feet occur in the Andes Mountains of eastern Coquimbo. The principal lowlands occur in the valleys of the Elqui, Limari, and Choapa rivers. Climatic conditions are generally temperate except in the higher mountains, and precipitation is light. Irrigation is widely practiced in the river valleys; cereals, beans, fruits, and hay are the principal crops. Sheep, goats, cattle, and mules are the most important livestock. Important mineral deposits in Coquimbo include iron ore, copper, lead, manganese, gold, and silver. La Serena is the provincial capital.

COQUIMBO, town, N central Chile, in the province of Coquimbo, on the Pacific Ocean, eight miles SW of La Serena. Coquimbo is a seaport, railroad terminus, and commercial center. The principal exports are copper, manganese, grain, hides, and fruits. Industries in the town include the manufacture of food products, wine, leather, and construction materials. Coquimbo Bay is the winter base of the Chilean navy. Pop. (1952) 32,132.

COQUINA, a limestone rock made up almost wholly of broken fragments of shells, such as those of the mollusk *Donax variabilis,* weakly held together by noncrystalline calcite. Relatively recent deposits are found off the coast of Florida, but the name is also applied to similar limestones of older and better consolidated formations. Coquina is sawed into blocks and used as a building material in Bermuda.

CORACLE is a small boat, usually oval in shape, made by stretching a cover over a light framework. It was in use before historic times by the ancient Britons, whose coracles consisted of wicker frames covered with hides. Later versions of the boat were made of broad wooden hoops covered with waterproofed canvas. This type is still used on Welsh rivers and Irish lakes for fishing. In paddling the one-man craft, the occupant sits on a thwart across the center. In Robert Louis Stevenson's *Treasure Island,* the marooned Ben Gunn used a coracle.

PAUL'S PHOTOS

A coral reef at low tide shows how islands are built up by the accumulating coral skeletons. Later, vegetation takes root from seeds brought by winds, tides, and waves.

CORAL, a group of marine animals which belong to the class Anthozoa. Most of the corals are colonial and all form a calcareous exoskeleton (see ANTHOZOA; COELENTERATA). There are about 6000 living and from 8000 to 10,000 fossil species of anthozoans which, in addition to the corals, include the sea fans, sea whips, sea pens, sea feathers, and sea anemones.

The typical coral's body, called a polyp, is cylindrical. At one end a crown of short tentacles surrounds an oral disk which contains a slitlike mouth. At one end of the mouth is a ciliated groove which draws in a current of water for respiration. The gullet, or pharynx, connects the mouth and the gastrovascular cavity. This cavity is divided into longitudinal connecting chambers by eight elongated membranes known as septa, which are attached at the outer edge to the body wall and at the inner edge to the pharynx. The inner edge of each septum is free below the pharynx and forms the septal filament which protrudes through the mouth to grasp food. Certain septa contain the gonads, or reproductive organs. The body wall is made up of two cell layers—the outer or ectoderm, and the inner or endoderm. These two layers are separated by a jellylike substance, mesoglea.

Colonies are formed asexually by a single sexually produced polyp. This polyp gives rise to a continuation of its gastrovascular wall, called a solenium, which rises to the surface, forming a bulge in the epidermis. The bulge develops into the oral end of a new polyp. Then tentacles are formed and a mouth appears. In some corals new polyps are created by budding. See REPRODUCTION IN ANIMALS, *Asexual Reproduction.*

The sexes are separate in some species of coral while other species are hermaphroditic, that is, both sexes occur in the same individual. Eggs and sperm formed by the gonads escape through the mouth of the polyp. Fertilization takes place outside the body, and the fertilized egg develops into a planula (larva). After a period of free-swimming existence the planula attaches to the substratum, becomes a full-grown polyp, and by budding produces other individuals to form a colony. In some species fertilization takes place internally, the embryo developing within the gastrovascular cavity of the mother polyp and remaining there until the planular stage.

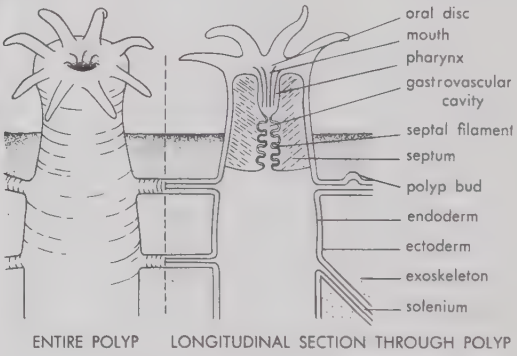
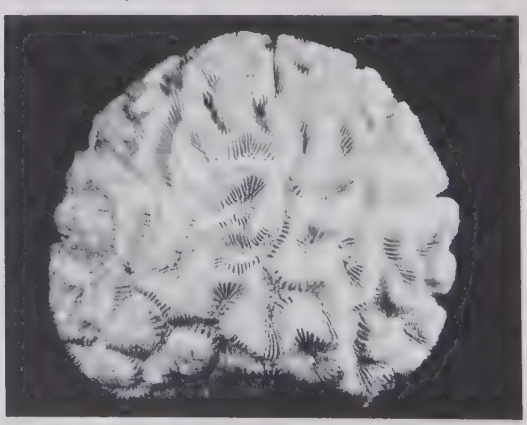


Diagram of a Typical Coral Colony

Skeletal Structure. A large number of animals build their skeletons from calcium carbonate taken from sea water. Although in the corals this procedure is not evident, calcareous crystals may be formed in a colloidal substance secreted by the coral's ectoderm. Colonial polyps usually form an exoskeleton of considerable bulk. The hard parts of several organisms whose skeletons form more or less compact rock are often loosely called coral; coral reefs, for example, contain calcareous seaweeds, tubes of worms, and sponges, in addition to coral. The belief that coral is built cell by cell by a busy coral insect after the fashion of a honeycomb is erroneous.

LYNWOOD CHACE

Butterfly Coral



RALPH BUCHSBAUM

Brain Coral

Coral is primarily a warm, shallow-water organism, but a few species live in cold, deep water. Many coral reefs and islands were built by corals belonging to the order Madreporaria, which includes forms having tentacles in multiples of six. The genus *Madrepora* is of great importance in reef-building, particularly in the Great Barrier Reef of Australia. A dried madrepore coral looks like a piece of porous limestone and is dotted over with distinct holes. In life, a small polyp protrudes from each of these holes, and the porous nature of the coral is due to the fact that the bodies of the polyps are connected with one another by the numerous solenia.

There is a great variety of colonial corals. When living they are often brilliantly colored, with the growing sections of the colony of different hues from the older parts. Such colors as green or greenish brown, red, blue, pink, and yellow often combine to give the reefs their beautiful tints. Another madrepore is the *Meandrina* which forms huge rounded masses, with the surfaces curiously grooved like the convolutions of a human brain. There are also the solitary corals, such as *Fungia*, the polyps of which often reach enormous size and possess great stinging power.

Coral Islands and Reefs. A reef is an area in which living corals, with their host of associated organisms, are found. As the reef grows larger it rises above the level of the sea, thus forming a coral island (see Atoll). The Bahamas and the Bermudas in the Atlantic, and some of the Fiji Islands in the Pacific show a thin crust of recent deposits covering a thicker mass of older limestone; only in a few places, such as the Ellice Islands, is the recent coralliferous limestone visible. The living reef-building coral is found in sea water as deep as 250 to 300 feet, but it grows best in regions extending to about half this depth. The rate of growth is not accurately known and differs with the various species of coral; the growth varies also according to the relation of the polyp to the ocean currents and to the general food supply. The supply of plankton (minute plants and animals drifting on the surface of the sea, on which the corals and other aquatic animals feed) is much smaller on the leeward than on the windward side of an island, and is less in the East than in the West Pacific. The corals, however, are found associated commensally (see Commensalism) with green algae, which require light. This association and the drifting of much of the food on the surface may explain the relatively shallow depths at which reef-building corals are found.

The three recognized types of coral reefs are fringing reefs, which border the coast of an already existing land mass and may be attached to the land or separated from it by a narrow expanse of shallow water; barrier reefs, which also border a land mass but are separated by a lagoon; and atolls, which are circular reefs enclosing a central lagoon. The depth of these lagoons varies from a few to several hundred feet. On the outside the coral reef or island may incline for some distance almost perpendicularly (for example, Bougainville Reef, more than 300 feet, and Funafuti, 800 feet) and slope very steeply thereafter. The steep slope may begin from the surface and inclines of 50° are not uncommon. It is believed that a group of coral islands rise from a well-marked submarine bank. The most intensive developments of corals probably occur in the relatively shallow seas off New Guinea and Australia in the West Pacific. But even in the Great Barrier Reef of Australia the crust of recent coral is relatively thin, older limestone constituting the main mass.

The horizontal distribution of reef-building coral is limited to the tropics or subtropics where the temperature of the surface water remains at about 70°F. The absence of coral reefs in the eastern parts of the oceans, except in small patches such as the Houtman Rocks off the western coast of West Australia, are thought to be due to cold currents that flow at the surface in these areas.

Various theories have been advanced to explain the formation of coral islands, most probable of which is that differential movements and volcanic eruptions have taken place in the ocean bed, leading to the formation of these islands.

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CORAL FISHES, any of the members of several families of fishes particularly abundant in the neighborhood of coral reefs. Included among these families are the *Chaetodontidae*, and the *Pomacentridae*. Although not closely related, the fishes of both families exhibit a resemblance in color and markings, which are believed to be an adaptation to life on the reef. The habits of the members of the families are closely similar. See Coloration of Animals.

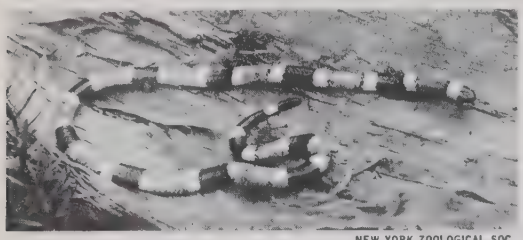
CORAL GABLES, city, SE Florida, in Dade County, on the Atlantic Ocean, at the mouth of Biscayne Bay, on the Florida East Coast and the Seaboard railroads and U.S. Highway 1; adjoining Miami on the SW. Coral Gables is a noted winter resort and residential community. The city was planned and constructed during the Florida land boom of the 1920s and was incorporated in 1925. It is the site of the University of Miami; Tropical Park race track is south of the city. Manufactures include awnings, boats, boxes, chemicals, millwork, plastics, and radio and electrical equipment. Pop. (1955 special census) 29,210.

CORAL SEA, an arm of the SW Pacific Ocean, bounded by New Guinea and the Solomon Islands on the N, the New Hebrides and New Caledonia on the E, and NE Australia on the W. Its name derives from the numerous coral islands and reefs in the sea, including the Great Barrier Reef off the coast of Queensland, Australia. An important naval engagement of World War II known as the Battle of the Coral Sea was fought here in 1942 between United States and Japanese fleets.

CORAL SEA, BATTLE OF THE, a naval air engagement of World War II, May 4–8, 1942. A Japanese naval and transport fleet, under the command of Vice-Admiral Shigeyoshi Inouye, with Vice-Admiral Takeo Takagi commanding the striking force and Rear Admiral Tadaichi Hara the carriers, set out to capture and occupy Tulagi in the Solomon Islands and Port Moresby on the southern coast of New Guinea. A United States task force commanded by Admiral Frank Fletcher, with Admiral Aubrey W. Fitch commanding the carrier force, moved into the Coral Sea to intercept them. The fall of Port Moresby might have secured Japanese domination of New Guinea and northern Australia.

The Japanese landed and occupied Tulagi on May 3. (See Solomons Campaign.) On May 7, the United States force, including the carriers *Lexington* and *Yorktown* and accompanying cruisers and destroyers made contact with the Japanese force—the carriers *Shokaku* and *Zuikaku*, the light carrier *Shoho*, and accompanying vessels. Throughout the battle, the ships of neither fleet saw their enemy, nor did they fire a shell. Aircraft from the United States carriers sank the *Shoho* with bombs and torpedoes, and Japanese aircraft sank the tanker *Neosho* and its escort destroyer, the *Sims*. On May 8 U.S. planes located the two remaining Japanese carriers, and scored hits on them and on other vessels, while Japanese planes attacked the *Lexington* and *Yorktown*. Both U.S. carriers were hit by bombs and the *Lexington* by torpedoes. Later, gasoline vapor in the hold of the *Lexington* exploded and uncontrollable fires followed. After all the men had been safely removed, the U.S. destroyer *Phelps* torpedoed the sinking ship. Battle was broken off about noon of May 8. Besides the loss of the carrier *Shoho* and smaller ships, the Japanese suffered damage to their other carriers, one of which was prevented from taking part in the crucial battle

of Midway the following month. (See MIDWAY, BATTLE OF.) Japanese occupation of Port Moresby and expansion to the south was prevented, and the tide of battle in the Pacific began to turn. In terms of naval warfare, the engagement demonstrated the importance of aircraft and carriers. See NAVAL STRATEGY AND TACTICS; WORLD WAR II.



NEW YORK ZOOLOGICAL SOC.

A member of the cobra family, the poisonous eastern coral snake, *Micrurus fulvius*, is found in the United States. This snake has black and red bands separated by yellow.

CORAL SNAKE is a small, highly poisonous snake found in the Western Hemisphere and belonging to the genus *Micrurus* of the cobra family *Elapidae*. Coral snakes usually bite only when stepped upon. They may reach lengths of five feet, but 18 inches is a more common length. Most of these snakes are banded, but they may be entirely black. The color pattern of the eastern coral snake of the United States, *M. fulvius*, consists of wide bands of red and black separated by narrow yellow stripes. The eastern coral snake feeds upon other snakes and lays two to four eggs.

CORAOPOLIS, borough, SW Pennsylvania, in Allegheny County, on the south bank of the Ohio River, on the Pittsburgh and Lake Erie Railroad; 10 miles NW of Pittsburgh. The manufactures of Coraopolis include chemicals, steel, and glass and metal products. Pop. (1950) 10,498.

CORATO, city, SE Italy, in the region of Apulia, Bari Province, 23 miles W of Bari. Southwest of Corato is the Castel del Monte, a medieval castle built by Emperor Frederick II. The city is surrounded by a fertile agricultural region producing grain, wine grapes, and olive oil. Pop. (1954) 45,300 including commune.

CORBEL, in architecture, is a projecting timber or block of masonry, frequently carved or otherwise decorated, employed to support a beam, arch, or cornice, and occasionally an oriel (a bay window projecting from the wall of a building). When decorated with S-scrolls, corbels are known as consoles.

CORBETT, JAMES JOHN, called Gentleman Jim, 1866–1933, U.S. prize fighter, was born in San Francisco, Calif. While employed as a bank clerk Corbett learned to box and became an amateur champion. Needing money, he turned to professional boxing at the age of 19, and gained fame in 1889 when he won over Joe Choynski. Later he defeated Jake Kilrain and Dominick McCaffrey. John L. Sullivan, then the world heavyweight champion, refused to fight Peter Jackson, a Negro; Corbett agreed to a match with Jackson, and on May 21, 1891, fought him to a 61-round draw. Corbett won the heavyweight championship on Sept. 7, 1892, in New Orleans, when he knocked out Sullivan in the 21st round. He lost the title to Robert Fitzsimmons in the 14th round of a fight in Carson City, Nev., on Mar. 17, 1897, and failed to regain it in matches with James J. Jeffries in 1900 and 1903. Corbett appeared on the stage, in motion pictures, and on the radio. He wrote *The Roar of the Crowd* (1925).

CORBIN, city, SE Kentucky, in Knox and Whitley counties, on the Louisville and Nashville Railroad, and U.S. Highway 25; 80 miles SSE of Lexington. Corbin is situated in the Cumberland foothills. The principal industry of Corbin is coal mining; lumbering and agriculture are also important. There are railroad shops and garment industries. About 14 miles SW of the city is Cumberland Falls State Park, noted for the moonbow of its waterfall. Pop. (1950) 7744.

CORBINO, JON, 1905– , U.S. painter born in Vittoria, Italy, was educated at the Art Students League of New York and the Pennsylvania Academy of Fine Arts. Best known for his powerful landscapes with figures of people and horses, he was compared with the baroque masters for his use of turbulent movement and dramatic color. Among his well known works is *Flood Refugees* (1938).

CORBULO, GNAEUS DOMITIUS, died A.D. 67, Roman general and provincial governor. Under the emperor Claudius, A.D. 47, Corbulo governed lower Germany. As a defense measure he had his troops dig a canal from the Meuse River to the Rhine; the canal was still in use in the twentieth century. After Nero's accession to the imperial throne, Corbulo's brilliantly successful Armenian campaign, 59–63, and his subsequent popularity made him the envy of other Roman generals, who scarcely tried to conceal their enmity. He was accused, probably falsely, of attempted usurpation, recalled from his command, and ordered to commit suicide. He complied with the order.

CORCHORUS, a genus of annual tropical plants belonging to the linden or basswood family, *Tiliaceae*. Jute, *Corchorus capsularis*, may grow 15 feet high. It has simple toothed leaves that are alternate and oblong, and straight thin stems that branch only at the top. The yellow flowers are very small; the fruit is wrinkled and globose. Jews' mallow, *C. olitorius*, differs from jute only in that its fruit is oblong and beaked. Both of these plants are native to Asia and are extensively cultivated there. The young shoots are used as herbs for flavoring; the fibrous bark of the mature plants is the source of jute. See JUTE.

CORCORAN, WILLIAM WILSON, 1798–1888, U.S. financier and philanthropist, was born in Georgetown, D.C. In 1837, after some years in the dry goods business and in real estate, Corcoran became a banker and broker, and was so successful that his firm at one time financed nearly all the bond issues of the U.S. government. He founded the Corcoran Art Gallery at Washington, D.C., this being but one of his many philanthropic activities.

CORCORAN, city, S central California, in Kings County, in the San Joaquin Valley, on the Santa Fe Railway, 13 miles SW of Tulare. Cotton gins and cottonseed oil mills serve the surrounding area. Pop. (1955 special census) 4824.

CORCYRA. See CORFU.

CORD or **CORDAGE.** See ROPE.

CORDAY D'ARMONT, MARIE ANNE CHARLOTTE, 1768–93, French revolutionary figure, assassin of Marat, was born at St. Saturnin in Normandy. Reared in a convent, Charlotte Corday had little contact with politics or the revolution until 1793 when, at the downfall of the Girondists, many of the fleeing leaders took refuge in Normandy. They held meetings there and attempted without success to rouse the populace in their favor. They did, however, excite the sympathies of Charlotte, who thereupon determined singlehandedly to save France from Marat, whom she had heard characterized as a tyrant and butcher of the innocent (Girondists). She went to Paris and gained admittance to Marat's chambers by claiming to be ready to betray a Girondist plot; and as Marat was speaking to her she stabbed him to death. She was seized immediately and guillotined four days later. Charlotte Corday has

Charlotte Corday

been called, variously, an avenging angel, a paranoid with a martyr complex, a true martyr, and traitorous murderess. She was the subject of much controversy and many arguments—some violent—and in literature has been sometimes heroine, sometimes villainess.

CORDELE, city, S central Georgia, county seat of Crisp County, on the Albany and Northern, the Atlantic Coast Line, the Seaboard Line, and the Southern railroads, and on U.S. highways 41 and 280; 63 miles S of Macon. The principal manufactures include men's clothing, textiles, agricultural and other machinery, wood products, and cottonseed and vegetable oils. The surrounding area produces peanuts, sweet potatoes, watermelons, peaches, and other fruits. Pop. (1950) 9462.

CORDELIERS, a club and center of agitation during the French Revolution, officially called the Society of the Friends of the Rights of Man and the Citizen. It first met in the former monastery of the Franciscans known as Cordeliers. Generally the Cordeliers demanded revolutionary measures.

CORDIAL. See LIQUEUR.

CORDIERITE, a complex silicate of magnesium and aluminum named after the French geologist P. Cordier. The mineral crystallizes in the orthorhombic system with short prismatic 6- or 12-sided crystals (see CRYSTALLOGRAPHY). The empirical formula of the mineral is $Mg_2Al_4Si_5O_{18}$. Cordierite has a specific gravity of 2.60 and a hardness of 7 to 7.5 (see HARDNESS). Its color is generally blue by transmitted light. Cordierite is found in a variety of rocks, both eruptive and metamorphic, and is generally associated with granite or mica schists. The blue cordierite pebbles of Ceylon, called *saphir d'eau* by jewelers, are used for gem stones.

CORDILLERA, originally an extended mountain chain or range; now generally a major regional grouping of mountain chains. The word, derived from the Spanish language, was first used in connection with the Andes Mountains of South America, where certain of the mountain chains are termed cordilleras. Geographers customarily recognize four cordilleran regions that include most of the world's great mountains—the North American Cordillera, including the Rocky Mountains, Coast Ranges, Sierra Nevada, and Sierra Madre; the Cordillera of the Andes; the Cordillera of southern Europe, including the Pyrenees, Alps, and Carpathian Mountains; and the Asian Cordillera, including the Caucasus Mountains, Elburz, Hindu Kush, Tien Shan, Kunlun, and Himalayas. See ANDES MOUNTAINS; MOUNTAIN.

CORDITE is a smokeless explosive used as a propellant in cannons and small arms. It derives its name from the cordlike form in which it is manufactured. Cordite was developed in Europe late in the nineteenth century as a composition of about 58 per cent nitroglycerine, 37 per cent nitrocellulose, and 5 per cent petroleum jelly. Later types were lower in nitroglycerine content and correspondingly higher in nitrocellulose. Cordite burns when ignited and detonates when subjected to a severe shock. See EXPLOSIVE, *Low Explosives or Propellants;* GUNPOWDER.

CÓRDOBA, GONZALO FERNÁNDEZ DE, called the Great Captain, 1453–1515, Spanish general, was born near Córdoba. Son of the Count of Aguilar, he demonstrated his military aptitude in the 10 years' civil war early in the reign of Isabella I and won the friendship of the queen. In 1495 he was sent to aid the King of Naples against Charles VIII of France, and his exploits in Italy won him the title Great Captain. Called by some the first modern general, Gonzalo formed an officers' training school; developed new, close-knit infantry formations; introduced the use of the pike instead of the sword by foot soldiers; and devised a form of protection, somewhat like barbed-wire netting, for open field defenses. He expelled the French from Naples and remained there as governor until 1507, when he was recalled by King Ferdinand.

CÓRDOBA, province, central Argentina, bounded by the provinces of Santiago del Estero on the N, Santa Fe on the E, Buenos Aires on the SE, La Plata on the S, San Luis and La Rioja on the W, and Catamarca on the NW; area 65,195 sq. mi.; pop. (1955) 1,792,555. Córdoba consists of mountains in the west, principally the Sierra de Córdoba, and lowlands in the east. The southern portion of the lowlands forms part of the fertile pampa region. The province generally has a light rainfall and is arid in the north. Numerous east-flowing rivers originate in the Sierra de Córdoba, including the Primero and Tercero, and in the northeastern part of the province is the large saline lake Mar Chiquita. Major crops of the lowlands are cereals, alfalfa, flax, tobacco, and vegetables. In the west, partly under irrigation, fruits, wine grapes, and vegetables are grown. Cattle, hogs, and horses are the principal livestock, and goats are important in the mountains. Magnesium, limestone, salt, tungsten, mica, and beryllium are mined in the province. Córdoba, Villa María, Río Cuarto, and Bell Ville are the main cities and industrial centers. Córdoba is the provincial capital.

CÓRDOBA, city, N central Argentina, capital of the province of Córdoba, in the foothills of the Sierra de Córdoba, on the Río Primero, about 400 miles NW of Buenos Aires. Córdoba is the third largest city of Argentina, forming a major commercial, industrial, cultural, and resort center. A large dam on the Río Primero has encouraged the city's industrial development. Leading industrial activities are the processing of textiles, leather, construction materials, and food products. Local agricultural produce includes cereals, flax, alfalfa, fruits, vegetables, and livestock. Córdoba has an observatory and various educational institutions, among them a national university founded in 1613. The city was established in 1573 and contains many fine colonial period buildings, including a magnificent cathedral. Pop. about 352,000.

CÓRDOBA, department, N Colombia, bounded by the Caribbean Sea on the NW, and the departments of Bolívar on the E and Antioquia on the S and W; area 9378 sq. mi.; pop. 359,830. Córdoba is made up largely of forested lowlands, with the low mountains of the Andean Cordillera Oriental in the west. The Sinú River, draining to the Caribbean, is the principal stream. A rainy tropical climate is experienced over most of the department. Leading crops are rice, corn, bananas, coconuts, cacao, sugar cane, tobacco, and cotton. Cattle raising is important and the extensive forests yield lumber and other forest products. Petroleum and gold are the chief minerals. Montería is the capital.

CÓRDOBA, city, E Mexico, in the state of Veracruz, in the Sierra Madre Oriental, 56 miles WSW of Veracruz. Córdoba is a railroad junction and an agricultural center. The surrounding farming area produces sugar cane, tobacco, bananas, coffee, and fruit. In August 1821, the treaty of Córdoba, which established Mexican independence, was signed here. Pop. (1950) 32,733.

CÓRDOBA or **CORDOVA,** province, S Spain, in Andalusia, bounded by the provinces of Badajoz and Ciudad Real on the N, Jaén on the E, Granada and Málaga on the S, and Sevilla on the W; area 5297 sq. mi.; pop. (1950) 790,242. The province is divided by the Guadalquivir River into a lowland southern section and a mountainous northern section. The northern mountains include the central part of the Sierra Morena. The climate is generally Mediterranean with hot summers, mild winters, and light winter precipitation; more extreme conditions prevail in the mountains. Southern Córdoba is a fertile agricultural area producing cereals, olives, wine grapes, fruits, vegetables, and tobacco. Lumbering and livestock raising are important in the uplands. Varied mineral resources occur in the province, principally copper, silver, lead, coal, bismuth, and iron. Processing agricultural products, winemaking, and textile manu-

facture are the main industries in the region. Córdoba is the provincial capital and leading industrial center.

CORDÓBA or **CORDOVA,** city, ancient Corduba, S Spain, in Andalusia, capital of the province of Córdoba, on the Guadalquivir River, 185 miles SSW of Madrid. The city of Córdoba is an important industrial, commercial, and communications center. It serves as a market for a rich agricultural region producing cereals, olives, wine grapes, fruits, vegetables, and livestock. Various minerals are produced in the vicinity, among them copper, silver, lead, and coal. Industries in Córdoba include the processing of textiles, leather, machinery, pottery, construction materials, paper, jewelry, beverages, and food products. Córdoba is also a popular tourist resort. In the city are narrow, winding streets and picturesque Moorish-type homes. The chief glory is the great mosque—since the twelfth century a Christian cathedral—which was begun in the eighth century. Its richly-adorned gates, multicolumned hall, chapel, and "Court of the Oranges" make it one of the masterpieces of Moorish architecture. Other notable monuments are an ancient Moorish bridge across the Guadalquivir River, a Moorish citadel, an old synagogue, churches, and museums. Córdoba has a very long history and first rose to importance under Roman rule. It passed into the control of the Visigoths toward the end of the sixth century and in 711 was captured by the Moors, under whom it became a great center of learning and wealth. It was at the height of its development in the tenth century. Thereafter decadence set in and in 1236 Córdoba was captured by Ferdinand III of Castile. In 1808 the city was occupied and plundered by the French. Pop. (1950) 165,403.

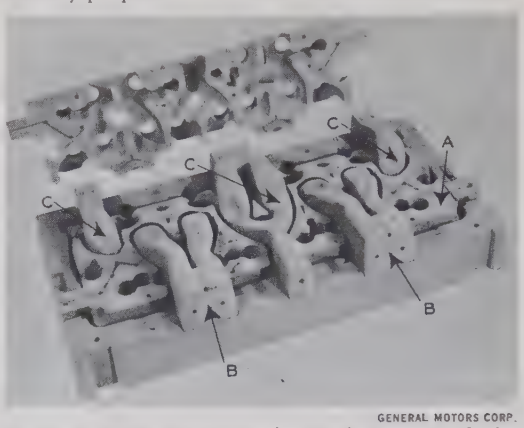
CORDOVA, town and port, S Alaska, on Prince William Sound, inlet of the Pacific Ocean, about 145 miles ESE of Anchorage. Cordova is a crab, clam, and pink salmon fishing and canning center. At the beginning of the twentieth century, the town was a supply center for the interior copper mining region. Pop. (1950) 1165.

CORDOVA. See Córdoba.

One of the outstanding examples of Moorish architecture in Spain is this tenth century mosque, now a cathedral, in Córdoba. Shown here is its colorful center aisle.

CHICAGO ART INST.

CORDUROY is a cotton or rayon cut-pile fabric woven with either a wide or narrow wale that is formed by using an extra filling. The foundation may be either a plain or twill weave. The material is used for coats, dresses, sports clothes, draperies, and upholstery purposes.



GENERAL MOTORS CORP.

One method of coring an overhead valve engine cylinder head requires a core assembly built upon a carrier core. *A, B, C:* water jacket, intake, and exhaust passage cores.

CORE, in metal casting, is a body placed in a mold to produce a hole or a cavity in the casting. Cores are usually made of sand held together by a binder, less often of metal and other materials. They are most frequently used with sand molds. The preparation of cores is a skilled trade and an important part of foundry practice.

Making a sand core begins with mixing sand and a binder. Many organic and inorganic materials are used for binders, the choice depending on the characteristics of the sand used, the kind of metal cast, the type of casting being made, and relative costs. Typical binders are resins, oils, corn flour, dextrin, plastics, fireclay, and blends of these materials. The mixture of sand and binder is formed to the desired shape by packing it into a core box. Projections called core prints are made at the ends of the core proper. These rest in recesses in the mold to hold the core in the correct position with respect to the mold. After the core is removed from the core box it is usually baked in an oven to harden it.

After the finished core is put into place in a sand mold, the mold is closed, and molten metal is poured in. When the casting has cooled, the mold is broken away, and the core is broken up and shaken out of the cavity it has formed. Among the many familiar products cast in sand molds with sand cores are heating-system radiators and engine blocks. See CASTING, *Sand-Mold Casting.*

CORE, ELECTRICAL. See ELECTROMAGNET; TRANSFORMER.

CORE CURRICULUM. See CURRICULUM.

CORELLI, ARCANGELO, 1653–1713, Italian violinist and composer, was born in Fusignano. He began his musical education when at 13 years of age he went to Bologna for violin lessons. In 1670 he entered the Accademia Filharmonica, where he studied with Giovanni Benvenuti. He settled in Rome in about 1685, and soon made a great reputation for himself as a composer and performer, and won the patronage of Cardinal Ottoboni, in whose palace he lived for most of his remaining years. Both Handel and Domenico Scarlatti had high regard for Corelli's work.

Corelli's claim to prominence in the history of music is threefold: he was an effective teacher and laid foundations for the future development of musical theory: he was a gifted violinist and established rules for modern violin technique; and he was a profound composer of music, with widespread influence. He

has been called the founder of chamber music and he played an important role in developing the sonata form for solo instrument. His music is notable for its simplicity of form, its conciseness, and its dignity of bearing. Among his best known works are the *Suonate da camera a tre* (1694) and the several *concerti grossi*, which were published posthumously in 1714.

CORELLI, MARIE, pseudonym of Mary Mackay, 1855–1924, English novelist, daughter of the poet and journalist Charles Mackay, born in London. Educated in France for a musical career, she turned to writing and had a spectacular success with the publication of *A Romance of Two Worlds* (1886), a skillfully written but lurid romance, which was followed in the same year by the publication of *The Vendetta*. Although she was a popular writer in England, her overly melodramatic novels failed to impress literary critics and soon lost their vogue. Her other works include *Thelma* (1887), *The Sorrows of Satan* (1895), *The Master Christian* (1900), *Holy Orders* (1908), and *The Secret Power* (1921).

COREOPSIS, or tickseed, is a genus of about 70 species of annual and perennial herbs belonging to the sunflower family, *Compositae*. Most of the species are American but some are found in Hawaii and Africa. The plants bloom throughout the summer and autumn. The leaves of the coreopsis are usually opposite and undivided. They may be entire, dentate, or pinnately cut. The medium or large radiate flowerheads are solitary or loosely panicled. The disk-florets are yellow, brown, or reddened near the top. The ligules, small leaf appendages, are usually yellow, but sometimes rosaceous or of different colors. The achenes are flat and often winged, two-toothed or two-awned or naked at the top. Some 20 species of coreopsis are widely cultivated in flower gardens and as border plants. The annual species, formerly called calliopsis, are readily raised from seed planted in spring. The perennial species may also be grown from seed or propagated by division and cuttings. Well known cultivated species are *C. atkinsoniana*, *C. drummondii* or Golden-Wave, *C. lanceolata*, and *C. tinctoria*.

L. W. BROWNELL

A Coreopsis Plant in Bloom

THEODOR JUST

CORFE CASTLE, town, S central England, in Dorsetshire, on the Isle of Purbeck (see PURBECK, ISLE OF) 4 miles from the English Channel, 60 miles SSE of Bristol. Corfe Castle, built during the Norman period, overlooks the town of the same name. The castle was the home of King John; Edward II was imprisoned here in 1326. It is noted for its defense against parliamentary troops in 1643. Pop. (1951) 1370.

CORFU, also Kerkira or Kerkyra, ancient Corcyra, island, W Greece, northernmost of the Ionian Islands, forming most of the province of Corfu, in the Ionian Sea, off the coast of W Greece and S Albania, separated from the mainland by the narrow Channel of Corfu; area 228 sq. mi.; pop. (1951) 100,957. Corfu is about 40 miles long and 17 miles wide in the north. Most of the island is only 3 to 4 miles in width. The northern part of Corfu is mountainous, rising to nearly 3000 feet. Rolling country occurs in the central section, and fertile lowland comprises the southern extension of the island. The climate is mild and agreeable with about 50 inches of rainfall annually. Agriculture is the main occupation, olives, cereals, fruits, and vegetables the principal crops. Olive oil, currants, and wines are the chief exports. Fishing and livestock raising are important. Corfu is one of the most attractive parts of Greece and the tourist industry is well developed. Corfu, a tourist center and seaport on the east coast, is the capital and principal city of Corfu province. Features of the city are a government palace, cathedral, citadel, museum, and the picturesque narrow streets lined with white houses.

FRITZ HENLE-MONKMEYER

The harbor at Corfu, still guarded by ancient defenses, has long been important because of the position of the island of Corfu near Albania and Greece on the mainland.

Corfu is traditionally identified with the Phaeacian island of Scheria, mentioned in Homer's *Odyssey*. It was colonized by Corinth in 734 B.C. but later clashed with Corinth in one of the first recorded naval battles (665 B.C.) In the fifth century B.C. Corfu separated from Corinth and allied with Athens, an action which lead to the Peloponnesian War. It was captured by the Romans in 229 B.C., and was taken from the Byzantines by Normans of Sicily in the eleventh century. In the twelfth and thirteenth centuries Corfu was briefly under the control of Venice, Epirus, and Naples. In 1386 the Venetians again acquired Corfu and held the island, although several times attacked by the Turks, until the collapse of the Venetian Republic in 1797. In the succeeding years Corfu was held successively by France, Turkey, and Russia. In 1815 it became a British protectorate. The British administration ended in 1864 when the island was ceded to Greece. In World War I French forces were landed on Corfu in support of the Serbian armies who had retreated there. The union of Croatia and Slovenia was proclaimed at Corfu in 1917. During World War II Corfu was occupied by the Italians. See IONIAN ISLANDS.

CORI, CARL FERDINAND, 1896– , U.S. biochemist, was born in Prague, Czechoslovakia, and was graduated from the German University of Prague, 1920. He emigrated to the United States in 1922 and became a biological chemist at the State Institute for the Study of Malignant Diseases, Buffalo, N.Y. After 1931 he was professor of pharmacology and biochemistry at Washington University, St. Louis, Mo. With his wife, Gerty Theresa Cori, and Bernardo Alberto Houssay, Cori shared the 1947 Nobel prize in physiology and medicine.

CORIANDER is the dried seedlike fruit of a strong-smelling annual herb of the family *Umbelliferae*. Native to southern Europe, the herb is related to parsley and carrots. Coriander, *Coriandrum sativum*, grows 1 to 3 feet in height, and has pinnately compound leaves and small white flowers. It is easily grown in garden soil. Coriander is often used as seasoning in pastries, candies, and liqueurs.

CORINNA, Greek lyric poetess of the fifth century B.C., was born in Tanagra in Boeotia. A contemporary of Pindar, she is said to have defeated him five times

in lyric contests. Writing in the Boeotian dialect, Corinna composed love songs, narrative poems, and choral works. A woman of beauty and great charm, she spent much of her life in Thebes. Her interest in mythology was reflected in her poems, one of which tells of the nine daughters of the river Asopus in Boeotia; another is based on the expedition of the Seven Against Thebes. Surviving fragments of her poems were collected by Theodor Bergk in *Poetae Lyrici Graeci* (3 vols. 1843).

CORINTH, city, NE Mississippi, county seat of Alcorn County, on the Gulf, Mobile, and Ohio, the Illinois Central, and the Southern railroads, and on U.S. highways 45 and 72; 5 miles from the Tennessee state line, and 89 miles ESE of Memphis, Tenn. Corinth has sawmills and machine shops and manufactures hosiery, men's clothing, sawmill machinery, and cottonseed products. In 1854, it was chosen as the site for the junction of two railroads and given the name Cross City. Two years later it was renamed for the Greek city, Corinth. During the Civil War, the city was an important railroad and strategic center. Confederate forces abandoned Corinth in May 1862 after the battle at Shiloh, Tenn. (See SHILOH, BATTLE OF.) The Confederates under General Van Dorn and Union forces under General Rosecrans met in a two-day battle near Corinth, Oct. 3–4, 1862, which ended in a Confederate retreat. A national cemetery where more than 6000 Civil War soldiers are buried is located here. Pop. (1950) 9785.

CORINTH or **KORINTHOS,** Latin Corinthus, S Greece, NE Peloponnesus, capital of the nome of Corinthia, on the S Gulf of Corinth, on the Isthmus of Corinth, 43 miles W of Athens. Corinth is the market center for an agricultural area producing dried fruit, citrus fruit, olives, cereals, silk, sheep, and goats. It is also a railroad center, port, and tourist center. Since 1896 the American School of Classical Studies at Athens has been conducting fruitful excavations at Corinth. Notable ruins include the temple of Apollo, a magnificent example of early Doric architecture; fountains, a market place, and a Roman amphitheater.

Corinth occupies a highly strategic location on the narrow isthmus between the Gulf of Corinth and the Saronic Gulf. The city has been important in Greek history from very early times and the ancient city of Corinth, now the site of the village of Old Corinth about 3 miles to the southwest of the present city, was known to the Phoenicians. According to Homer, Corinth was subject to Mycenae. By the eighth and seventh centuries B.C. Corinth had developed into a prosperous maritime power. It was a great intellectual center and was noted for pottery making and shipbuilding. Corinth was active in colonization, founding Syracuse, Corfu, Potidaea, and other cities. Rivalry arose between Corinth and Athens and in the Peloponnesian War Corinth allied with Sparta against Athens. Later in the Corinthian War Corinth was on the side of Thebes and Athens against Sparta. In the fourth century B.C. the power of Corinth declined and the city became tributary to Macedonia. Corinth was briefly independent of Macedonia in the middle of the third century. When the Romans declared Greece free in 196 B.C. Corinth took a leading part in the Achaean League, but came into conflict with Rome and in 146 B.C. the city was sacked by Roman armies. Julius Caesar refounded Corinth in 44 B.C. as Achaea, the city which was visited by Saint Paul. Achaea achieved considerable commercial importance, although later it suffered severely from the barbarian invasions. After a turbulent medieval history, Corinth was taken by the Turks in 1458. Venice held the city from 1687 until 1715 when it was again captured by the Turks. In the Greek war of independence Corinth was largely destroyed. Disastrous earthquakes struck the city in 1858 and 1928. Pop. (1951) 17,728. See GREECE, *History*.

CORINTH, GULF OF, Greek Korinthiakós Kólpos, an arm of the Ionian Sea, lying between the mainland of Greece on the N and the Peloponnesus peninsula on the S; and linked with the Ionian Sea through the Rion Strait and the Gulf of Patras (Patraïkós Kólpos). The Gulf of Corinth is about 80 miles long and from 3 to 20 miles wide. Principal cities near its shores are Navpaktos on the north and Corinth and Aíyion on the south.

CORINTH, ISTHMUS OF, a strip of land connecting the mainland of Greece with the Peloponnesus peninsula, lying between the Gulf of Corinth (Korinthiakós Kólpos) on the W and the Saronic Gulf (Saronikós Kólpos) on the E; crossed by the Corinth Canal, an artificial waterway, connecting the two gulfs. The isthmus is about 20 miles long and from 4 to 8 miles wide; Corinth is the principal city. On the isthmus are the ruins of the Isthmian Walls, a temple to Poseidon, and the site of the Isthmian games. The Corinth Canal, opened in 1893, was damaged by the Germans in 1944 during World War II.

CORINTHIA, province, S Greece, NE Peloponnesus, bounded by the Gulf of Corinth on the N, the Saronic Gulf on the E, and the nomes of Attica on the NE, Argolis and Arcadia on the S, and Achaea on the W; area 880 sq. mi.; pop. (1951) 113,358. Corinthia is a mountainous area with peaks rising above 7000 feet. Agriculture is the main occupation and the nome is noted for currant production. Other crops include cereals, citrus fruit, and olives. Sheep and goats are the principal livestock. Fishing, in-

Overlooking the Doric ruins of the Temple of Apollo on the site of ancient Corinth, near the modern city, is the citadel, or Acrocorinthus, rising nearly 1900 feet.

Virtually as primitive as that of 4000 years ago is the life of Corinth's peasantry today. Here women draw their water supply from a centuries-old spring in the city.

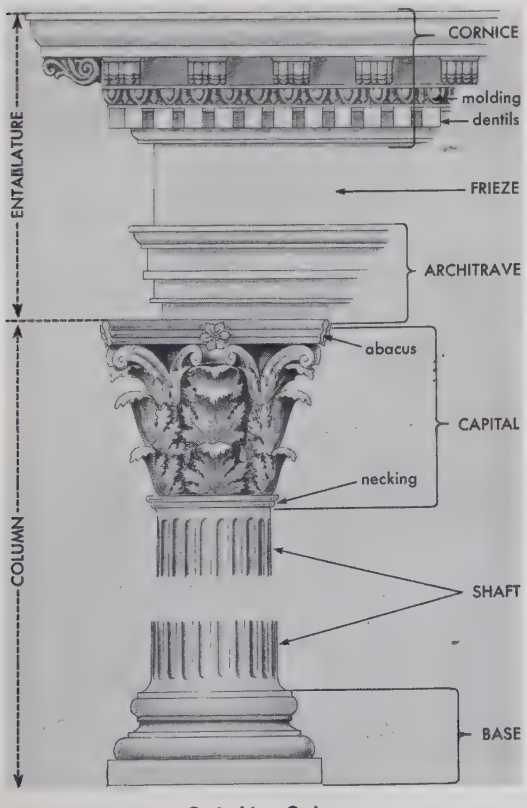
EWING GALLOWAY

cluding sponge fishing, is an important activity in coastal waters. Corinth is the capital of the nome. Corinthia was created a separate nome in 1950 from the previous division of Argolis and Corinthia.

CORINTHIAN ORDER, the last developed of the three orders of Greek architecture, used during the second and first centuries B.C. in Greece and later in Rome. A variant of the Ionic order, the Corinthian differed chiefly in the style of its column capitals. While retaining the slender, fluted Ionic column shafts, the Corinthian capital consisted of a bell-shaped core decorated with two rows of realistically carved acanthus leaves from which rose slender volutes. The Ionic entablature and frieze were little changed, except for the addition of decorative moldings. The Corinthian order was not widely used in Greece, probably being too elaborate for Hellenic tastes. Of the few Greek examples of the style, the Temple of Zeus Olympus (174 B.C.) and the Choragic Monument of Lysicrates, both in Athens, were noteworthy for their consistency of form. Roman architects found this order well suited to their monumental structures and employed it in buildings throughout the areas of their conquests. It was developed into its final form in the Pantheon in Rome (A.D. 120–124), where smooth-shafted instead of fluted columns were used. A Roman innovation was the Composite order, which differed from the Corinthian in that its capital was compounded of Doric, Ionic, and Corinthian motifs with Roman embellishments. See IONIC ORDER.

CORINTHIANS, I, II, two Epistles of the New Testament written by Saint Paul. The First Epistle was probably written A.D. 57 at Ephesus and was delivered by Timothy. Paul had spent at least 18 months at Corinth several years before (Acts 18), but later the congregation had split into factions and had tolerated certain moral scandals. In the First Epistle Paul reproved the Corinthians for their party spirit and reminded them that they were united by baptism with Christ (chap. 1–4); he condemned incestuous practices, warned against litigation and sexual immorality, and discussed marriage and family living (5–7). He further expounded the theme of Christian liberty, warned against idolatry and gave counsel on various points in Christian worship (8–11); gave advice concerning spiritual gifts and their regulation (12–14), with a magnificent digression in chapter 13 to extol love as the greatest of spiritual gifts; expounded the doctrine of the resurrection (15); and closed with personal details and the usual salutation (16). The Epistle has been called an "inexhaustible mine of Christian thought and life."

The Second Epistle was probably written later in A.D.57 and delivered from Macedonia by Titus. This letter consists largely of Paul's self-vindication against attacks, his defense of his apostolic standing, and his rejoicing that the first letter had brought repentance. There is a section on Christian liberality, the occasion for which was the collection for the poor saints in Jerusalem. See PAUL, SAINT; BIBLE; NEW TESTAMENT.



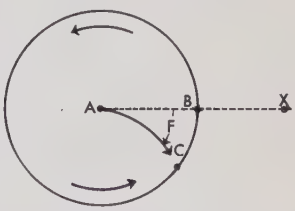
Corinthian Order

CORINTH SHIP CANAL. See CORINTH, ISTHMUS OF; CANAL; GREECE.

CORINTO, town, W Nicaragua, in the department of Chinandega, on the Pacific Ocean, 63 miles NW of Managua. Corinto is a railroad terminus and the major Pacific coast port of Nicaragua. Leading exports are coffee, sugar, hides, and lumber. Corinto was founded in 1840 as Punta Icacos and rapidly rose to importance as a seaport. Pop. (1950) 4765.

CORIOLANUS, GAIUS or **GNAEUS MARCIUS,** legendary Roman hero of the fifth century B.C. He was called Coriolanus because of his courage in the capture of Corioli, capital city of the kingdom of Volsci. During a famine in Rome, 490 B.C., Coriolanus opposed distribution of provisions obtained from Sicily to the plebeians unless they would agree to abolish their tribunes. He became so unpopular for this stand that he was banished. Seeking revenge, he went to the Volsci, gained command of their army, and marched on Rome. With the Volscian army camped within sight of the city, the Senate sent envoys to Coriolanus, who decreed that Rome could have peace only by the surrender of territory taken from the Volsci. Finally, after entreaties by a delegation of Roman matrons headed by his mother Veturia, and his wife Volumnia, Coriolanus withdrew his army and lived with the Volsci for the rest of his life. His career inspired Shakespeare's *Coriolanus*.

CORIOLIS FORCE, an apparent force acting on all particles moving over the earth's surface. This force tends to deflect particles moving in the Northern Hemisphere to the right and those moving in the Southern Hemisphere to the left. If a boy threw a ball to a point in outer space, an observer in space would see the ball move in a straight line, whereas the boy on earth would see it as taking a curved path. This apparent deflection is caused by the rotation of the earth. The magnitude of deflection of a particle moving over the earth's surface is proportional to the velocity of the particle. This apparent force is greatest at the poles and zero at the Equator.



CORIOLIS FORCE

Assume an object at *A* is moving toward *B*. An observer at *X* would see the object move in a straight line toward *B*. To an observer at *A* the path of the object appears to be curved to point *C* because of the change in position of point *B* caused by the rotation of the plane. *F* is the Coriolis force.

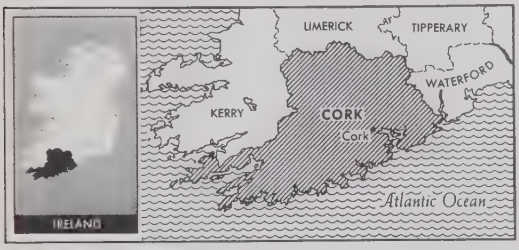
The Coriolis force produces a variety of phenomena in nature. Its effects are particularly noted in geology, meteorology, ballistics, and celestial nav-

igation. The right banks of rivers in the Northern Hemisphere are more rapidly eroded than the left, eventually causing the stream's course to change. Air masses moving north from the Equator are deflected eastward. The effect of this force must also be taken into consideration in the study of ballistics. The effect on small arms is negligible, but for long-range guns the deflection of the missile is appreciable. Navigators must also correct for the Coriolis force if they determine their position by the stars. A small deflection of the leveling bubble in their instruments may mean a difference of several miles in the location of the ship or plane. See FERREL'S LAW.

CORISCO. See SPANISH GUINEA.

CORIZZA. See KORÇË.

CORK, RICHARD BOYLE, 1st EARL OF, called the Great Earl of Cork, 1566–1643, British political leader, was born in Canterbury. He became lord justice of Ireland, 1629, and lord high treasurer, 1631. Cork helped to impeach his opponent, Thomas Wentworth, 1st Earl of Wentworth, as lord deputy, and suppressed the Irish rebellion of 1641.



Location Map of Cork

CORK, Gaelic Corcaigh, county, SW Ireland, in Munster, bounded by the counties of Limerick on the N, Tipperary and Waterford on the E, Kerry on the W, and the Atlantic Ocean on the S; area 2880 sq. mi.; pop. (1956) 336,687. Cork, the largest county in Ireland, has a generally mountainous terrain but some lowlands occur around the coast and in the east. Caherbarnagh (2239 ft.), in the Derrynasaggart Mountains of western Cork, is the highest point in the county. The coastline is bold and rugged with many deep inlets, including Youghal Harbor, Cork Harbor, Kinsale Harbor, Clonakilty Bay, Roaringwater Bay, Dunmanus Bay, and Bantry Bay. Numerous small islands occur off the coast. Major rivers are the Blackwater, flowing into Youghal Harbor; the Lee, flowing into Cork Harbor; and the Bandon, flowing into Kinsale Harbor. Agriculture is the chief occupation in the county; potatoes, turnips, sugar beets, oats, and barley are the principal crops. Cattle raising, dairy farming, and fishing are also important. Mineral products of Cork include copper, coal, barites, iron, lead, and manganese; the area is also noted for red and gray marble. Industries in County Cork include the manufacture of woolens, clothing, leather, machinery, chemicals, cordage, and food products. Cork is the county seat; other towns are the port of Cóbh, Bantry, Passage West, Clonakilty, Fermoy, Youghal, and Mallow. Cork has numerous prehistoric remains, early Christian relics, and medieval castles, among them the famous Blarney Castle (see BLARNEY). Tradition has it that Sir Walter Raleigh planted the first potato, brought from the New World, in the garden of his home at Youghal.

Gougane Barra, hemmed in by rugged mountains, is one of County Cork's most romantic spots. Here on a wooded islet in the lake is a ruined sixth century hermitage.

IRISH TOURIST BUR.

IRISH TOURIST BUR.

Cork is South Ireland's chief passenger port, with a busy export trade in all kinds of agricultural produce. Distilling, brewing, and bacon curing are leading industries.

CORK, Gaelic Corcaigh, county borough, S Ireland, capital of County Cork, on the mouth of the Lee River, near Cork Harbor, 135 miles SW of Dublin. Cork is the second largest city of Ireland and an important seaport with extensive dock facilities. Its trade is mainly with British and Irish ports; leading exports are dairy products, cattle, grain, textiles, and fish. Nearby on Cork Harbor are the transatlantic ports of Cóbh and Passage West. Industries in Cork include the manufacture of food products, machinery, ships, automobiles, chemicals, textiles, clothing, and leather. The city has many interesting features, including the Protestant cathedral, built in 1879 on the site of an earlier church; the Roman Catholic cathedral, dating from 1808; the University College (founded 1849), the courthouse, and the customhouse. In 1720 Cork established the first yacht club in the world. According to tradition the city was founded in the early seventh century by St. Finbar. The original settlement consisted of a monastery on an island in the Lee River. This island now forms the ancient central section of Cork and is connected with the mainland by numerous bridges. Cork was raided frequently by the Danes and in the ninth century was the site of a Danish colony. Toward the end of the twelfth century the Lord of Desmond ejected the Danes and acknowledged King Henry II of England, thus preparing the way for English settlers. The city was captured by Oliver Cromwell in 1649 and by the Duke of Marlborough in 1690. Here in 1920 Terence MacSwiney, lord mayor of Cork, died in prison after a two-months' fast in protest against British rule over Ireland. (See BLARNEY; CORK county.) Pop. (1956) 79,945.

CORK is a cellular material covering the older parts of roots and stems of many plants. The cork of commerce is the soft, spongy, somewhat elastic, outer layer of the bark of the cork oak, *Quercus suber*, a native of southern Europe and North Africa. This stout, round-topped tree grows to a height of 60 feet. The evergreen leaves are ovate to oblong, smooth and dark green above, and hairy or smooth beneath. The outer layer of bark falls from the trees at certain

CORK

ARMSTRONG CORK CO.

Baled cork is loaded from barges to freighters preparatory to shipment overseas. The United States consumes nearly half of the world's cork.

Cork workers in Portugal remove bark from cork oak in single piece. Trees grow to 40 feet during 150-year life.

CROWN CORK & SEAL CO., INC.

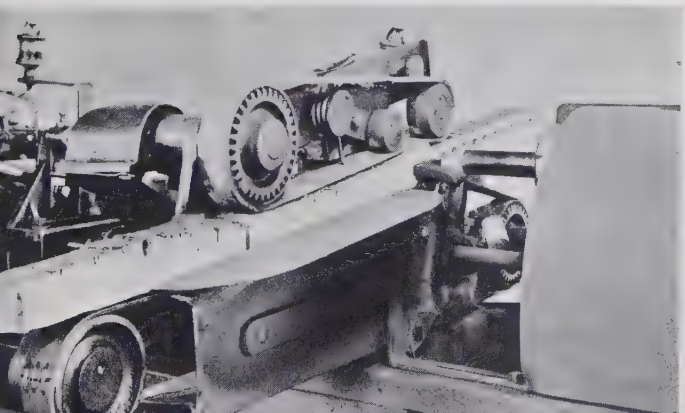
ARMSTRONG CORK CO.

After steaming to soften the wood, cork slabs are cut into fillets. The width is determined by length of the stopper.

CROWN CORK & SEAL CO., INC.

ARMSTRONG CORK CO.

After rough sorting, flattened pieces of cork are ready to process. Photo insert shows the cellular structure of cork.



Fillets are put on automatic blocker to punch out stoppers, which are washed, bleached, sterilized, carefully sorted.

ARMSTRONG CORK CO.

periods. Until the tree is 5 inches in diameter and about 20 years old, the bark is of little value, and it is removed only to facilitate growth of new layers. After the original cork has been removed, the tree may be stripped thereafter at intervals of 8 to 10 years. Second peelings, although inferior, are used in the manufacture of life preservers, floats, fish nets, and lifeboat linings. High-quality cork is obtained in the later strippings, and the product increases in firmness and value with each subsequent peeling. The finest cork, produced after the tree is 50 years old, is used to make grips for bicycle handle bars, corks, bottle rings, and pipefittings. See BARK; PLANT STRUCTURE, Tissues, *Embryonic and Meristematic Tissues*.

If regularly stripped, cork oaks thrive for 150 years or more. At one time all cork was cut by hand; now the work is done chiefly by machine. The bark is cut into square pieces or sheets, dried and seasoned, soaked in water, and then boiled. Boiling facilitates flattening of the cork, removes the tannic acid, and increases volume and elasticity. For the manufacture of corks for bottle stoppers, the bark is boiled twice and sorted into grades that differ in quality and thickness. After sorting, corks are cut out of small square blocks, polished by a sandpapering machine, washed, sorted, disinfected, and counted. Cork insulating boards, wall coverings, linoleum, cork carpet, tile, and cork brick are constructed from ground cork mixtures which have been treated with heat and pressed. Cork is a poor conductor of heat and is resistant to moisture and decay. It is also a useful ingredient in soundproofing materials, bath mats, case linings for insect collections, and packing papers. The loose cell structure of cork accounts for its buoyancy, compressibility, elasticity, and low thermal conductivity. Algeria, Morocco, Tunisia, Spain, and Portugal supply the world with most of its cork, with the Spanish provinces of Gerona, Barcelona, and Seville giving the finest yields.

CORK HARBOR, inlet of the Atlantic Ocean, S Ireland, on the SE coast of County Cork, at the mouth of the Lee River. Cork Harbor, one of the finest protected anchorages in the world, is about 10 miles long and reaches a maximum width of 6 miles. It is irregular in shape and consists of two main arms which almost completely enclose Great Island on which Cóbh is located. The northwestern section of the inlet is known as Lough Mahon and contains the seaport of Passage West. There are several small islands in Cork Harbor, including Spike, Rocky, and Haulbowline, some of which were garrisoned by the British until 1938. A narrow channel about 2 miles long and a mile wide leads to the open sea.

CORM, a solid, swollen portion of the stem of certain plants that is located on or beneath the ground. The corm contains reserve materials and closely simulates a bulb (see BULB). Crocus and gladiolus are examples of plants having corms.

CORMORANT, a large water bird, usually black, belonging to the family *Phalacrocoracidae*. There are about 30 species. The cormorants vary greatly in size and frequent islands in most parts of the world. These birds are about 3 feet in length, with relatively small heads, naked behind the eyes and at the root of the beak. There is a dilatable membrane beneath the lower jaw; the bill is moderately long, straight, rounded above, and strongly hooked at the end. The neck is long and snakelike. The wings are of moderate length, but the tail is rather short and rounded, with stiff feathers. The unfeathered lower leg is very short and all the toes are united in a web. The middle claw is serrated for preening the plumage.

Double-crested Cormorant

The numerous species live on the shores of islands, or sometimes by inland rivers and lakes. They feed exclusively on fish and dive from the surface of the water. When prey is seized, it is often tossed in the air and adroitly recaught so that it may be swallowed more easily. The nests, rude but strong, are usually built of seaweed. The egg is bluish green, but the color is much obscured by thick incrustations of lime. Fishing with cormorants has been practiced in China and Japan since ancient times.

The common cormorant, *Phalacrocorax carbo*, is an almost cosmopolitan bird 3 feet long. For the most part it is of a blackish green metallic color, with brownish feathers on the shoulder region. When in full breeding plumage it has a crest on the head, white plumes on the throat, and a white patch on the lower flanks. The bill and feet are black, the face yellow. The Peruvian cormorant, *P. bougainvillei*, is important for the production of the fertilizer guano. See GUANO.

CORN, or clavus, is a thickening of the skin caused by friction and pressure. A corn may occur anywhere, but is commonest on the toes. Hard corns occur on dry surfaces, but soft corns form in moist areas, such as between the toes. The hard corn begins as a general diffused thickening of the skin, often over the joint of the little toe, where there is pressure upon the skin between the shoe and the bone. The thickening increases the pressure; at the point of the corn there is formed a cone-shaped thickening, pointing inward and consisting of skin in cuplike layers, one within the other.

Corns may be prevented by wearing shoes that fit properly. There are several types of felt pads that will help alleviate some of the pressure. The corn should be removed only by adequate antiseptic means.

USDA

CORN

A gift from the New World, it feeds both man and the animals that supply his meat.

CORN, or Indian corn, the grain crop whose precise English name is "maize." In England "corn" commonly refers to wheat; "cornflowers" are so

called because they are common weeds in wheat fields. In Scotland a cornfield is a field of oats. Maize is a better name since it is similar to the common names for this crop in German, Spanish, and various other languages. In the United States "Indian corn" was long ago shortened to "corn."

Corn is completely in a class by itself in its adaptability to different soils and climates. In the New World one variety or another is grown from the tropics to southern Canada and from the humid lands around the Caribbean to the Great Plains, and even in the Sonoran desert. Unlike other tropical plants, corn is grown at all elevations in the tropics; in Peru, for example, it is cultivated from sea level to 12,000 feet. It is the only tropical plant commonly grown as a crop well outside the tropics.

Botanically, corn is a unique giant grass. It is a member of the genus *Zea* and, aside from the Central American weed teosinte, it has no close relatives. In the New World the closest relatives of these two plants are the gama grasses (*Tripsacum*), and in the Orient a number of primitive grain and ornamental crops belonging to *Coix*, "Job's tears," and several related genera. See TEOSINTE; GAMA GRASS.

Freshly germinated corn possesses a taproot as well as smaller roots issuing almost directly from the seed. Soon after the shoot appears above ground, strong vigorous roots begin to emerge from the lower nodes of the stem, and these "prop roots" eventually develop an extensive root system. The stem or culm rises straight upward and is usually unbranched, although it frequently gives rise to additional shoots (tillers or "suckers") at the base. The long narrow leaves are arranged alternately on two sides of the stem as in most other grasses, and are divided into a cylindrical sheath which clasps the stem and a flat, more or less channeled blade.

The male and female flowers are borne in separate inflorescences—the male, commonly known as the tassel, at the top of the plant, and the female in short, heavy inflorescences (the "ears") which are really greatly condensed side branches (see INFLORESCENCE). The ears are protected by special leaves known as husks, from the ends of which protrude the long styles of the female flowers which are commonly known as silks. It is this complete separation of the female and male inflorescences which has made possible the development of the hybrid corn industry in the U.S. corn belt. Owing to this fortunate circumstance, controlled breeding of whole fields of corn may be carried out with untrained help by such simple methods as pulling out the immature tassels by hand and by covering ears and tassels with large paper bags to control the pollination process. See BREEDING.

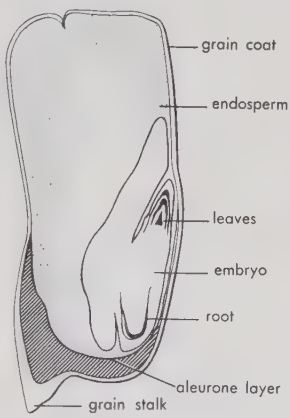
The mature ear of corn is unlike anything produced by other grain crops. The central axis or cob is thickly set with the mature kernels, which in most varieties are in straight rows running the length of the cob. The number of rows vary from 8 to 30 in different varieties of field corn, although 40 or more rows are known in certain popcorns. The kernel is made up of the embryo or germ and the endosperm, the storage organ which makes up the bulk of the seed. Most of the oil is concentrated in the embryo and the endosperm is largely starch; there is a fine network of protein around the individual starch kernels and more protein in the aleurone layer at the surface of the endosperm. See SEED, *Seed Structure.*

The Origin of Corn is one of the great unsolved problems of economic botany, although it has attracted students who have attacked the problem from many different angles. Corn's only close relative, teosinte, was long thought to be a probable ancestor and is still so considered by some authorities. P. Mangelsdorf and R. G. Reeves, however, presented a variety of evidence to indicate that teosinte is itself the result of hybridization between corn and gama grass and probably arose after the domestication of corn. Whenever or wherever corn originated, it was widely cultivated in the New World in pre-Columbian times, from Chile to eastern Canada. Many of the major types of corn were then already in existence and it was held in religious awe by many native peoples.

With the discovery of the New World, corn was introduced into the Mediterranean, where it spread rapidly and is now a staple crop in the northern Balkans, southern Russia, and in South Africa. In the New World the greatest centers of production are in Argentina and in the corn belt of midwestern United States. In parts of Iowa and Illinois nearly one-half of the total land surface is planted to it in any one year. The crop is also widely grown in parts of the Orient, northern India, southern China, and the southern Philippines but little is exported from these regions.

Wherever its place of origin may have been, there is no doubt that certain areas have been of particular importance in the production of new types of corn. One such area is in highland Peru and Bolivia, where corn is still grown in an incredible variety of shapes, colors, and textures. Another less known area is in the upper Amazon basin. In North America a comparatively small region in northwestern Guatemala is equally important, and Mangelsdorf has stated that there is as much variation in the corn of this region as in all the rest of North America put together.

Varieties of corn are so numerous, so manifold, and belong to so many different races that have been intercrossed in such bewildering profusion that the scientific classification of corn is still in its infancy. In the 1880s E. L. Sturtevant used the texture of the kernel as a cataloguing device and separated corn into six groups: flint corns, flour corns, dent corns, sweet corns, popcorns, and pod corns. Since he dignified these pigeonholes with Latin names, many authors have taken his classification more seriously than Sturtevant intended. Fifty years later Edgar Anderson and H. C. Cutler took up the problem anew, calling attention to the need for a natural classification of corn.



Cross Section of Kernel of Corn

The variation in corn has to be seen to be appreciated. The kernel may be smaller than a small pea or nearly as big as a large lima bean. It may be round or pointed, heart-shaped or long and narrow. It may be red, white, yellow, orange, black, brown, striped, or speckled. The texture of the kernel may be hard and flinty, soft and starchy, or even gummy. The ear may be more than a foot long or smaller than one's finger. It may have the kernels in straight rows, or arranged spirally with cross-rowing like the scales of a pine cone, or have no evident rows. The cob may be light and almost papery or as hard as the hardest wood. The plants may be knee-high or so tall that the crop is harvested on horseback. The leaves may be light green, dark green, bright red, or dull purple, and the plant may be smooth or densely hairy. It may mature a crop in two months or it may take more than 10 months to ripen. No other crop can approach corn in its bewildering variety of forms.

Before the advent of hybrid corn the bulk of the crop in the American corn belt, though belonging to

INTERNATIONAL HARVESTER CO.

In contrast to farming a few decades ago, when "shucking" 150 bushels of corn was a big day's work, this two-row, tractor-mounted picker easily harvests 25 acres or more.

many varieties, was of a definite type of yellow dent (referring to the depression in the tip of each mature kernel). This general type originated in the nineteenth century, mainly from the crossing of short-eared white dent corns of Mexican origin and long-eared 8- to 10-rowed yellow varieties with a hard, flinty kernel from eastern United States. Outstanding varieties were Reid's Yellow Dent and Krug, the former having given rise to a large number of subvarieties, many of which bore the name of the originator. In New York state and New England, 8- to 10-rowed varieties of flint corn were grown, though dent varieties pushed progressively farther north and east. Longfellow and King Phillip are outstanding varieties.

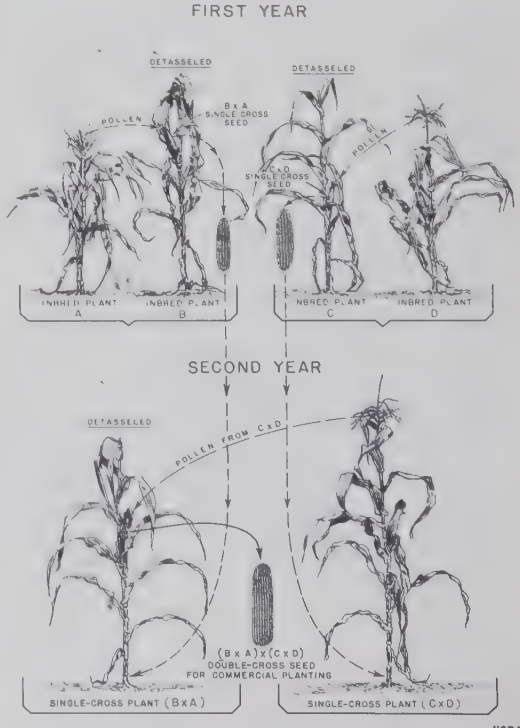
While any variety of corn may be used as a garden vegetable if picked before it is fully mature, the 1800s saw the development in the United States of numerous varieties selected for their flavor, high sugar content, and texture as sweet corns. In most of these varieties there is so much more sugar among the storage materials of the endosperm that the mature seed has a wrinkled and shrunken appearance. Outstanding varieties are the yellow Golden Bantam and the white Country Gentlemen. The canning of these two varieties has developed into an industry of considerable importance. A minor industry centers around the popcorns. Varieties of lesser importance are the white, large-kerneled corns used for making hominy, and the flour and flint varieties grown by the Indians of the plains and the Southwest. Other types of corn that are outstanding are the short-eared, many-rowed dents of central Mexico, the hard, slender-eared varieties of western Mexico, the long, slender-eared tropical flints widely grown in lowland South America, and the small-eared varieties with great diversity of colors grown in the South American highlands from Ecuador to Bolivia. See HOMINY; POPCORN.

Hybrid Corn. The introduction of scientific breeding methods revolutionized corn growing in the United States between 1926 and 1940. Corn is naturally a cross-pollinated crop but the arrangement of its floral parts makes it possible to inbreed it artificially with a minimum of labor. E. M. East and G. H. Shull in 1906 called attention to the practical possibilities of these techniques, and by 1926 hybrid corn had made its commercial appearance in the U.S. corn belt, where Henry A. Wallace played an outstanding role in developing it from a scientific possibility to a commercial reality.

While details vary with the strain of corn and the region in which it is cultivated, hybrid corn is produced more or less by the following method: after about five generations of continuous artificial inbreeding, the original open-pollinated varieties are broken up into a large number of uniform inbred "lines," all of which are comparatively weak and many of which are discarded in the breeding process. Eventually four different lines are selected for the production of each hybrid variety. If any such set of four is designated as line A, line B, line C, and line D, the breeding procedure is as follows: the first year, lines A and B are planted in alternate strips in an isolated field and C and D are similarly planted in another isolated plot. One of the lines in each plot will have been selected as the male parent because it is characterized by abundant shed of pollen from its tassels; the other line will have been selected as a female parent because its sets seed well. In each of the two plots the young, undeveloped tassels will be pulled out of the tops of the female line as they come into blossom; therefore all the pollen which flies in the air will be from the male line and the ears on the female line will all bear hybrid seed, A × B in one plot and C × D in the other. The second year these two hybrids are planted alternately in a larger increase block; one of them is detasseled and the resulting seed is a four-way hybrid, A × B × C × D.

This four-way cross is the seed which is marketed. Crossing has restored the vigor which was lost upon inbreeding, and the inbreeding process has produced a standardized, uniform product. The hybrid varieties have the extra vigor and dependability under bad conditions which are generally charactertistic of many hybrids, and they are so uniform that they can be grown by mass production methods and be planted, cultivated, and even harvested with power machinery.

Hybrid varieties created in this fashion will not breed true and the farmer must therefore purchase new seed every year. This circumstance has led to the development of hybrid seed companies which create such hybrid varieties and sell them to the farmer. In the drought of 1936 hybrid corn demonstrated its ability to make a crop under adverse conditions and within five years the bulk of the American corn crop was being grown from hybrid



USDA

Inbred corn crossed the first year results in single-cross plants; these are crossed in the second year to produce double-cross seed corn to be used in commercial planting.

CORN

Growth of hybrid seed corn is aided by irrigation on this Nebraska farm as soon as female ears are detasseled.
USDA

One of the first steps in hybrid corn development is the bagging of tassels of selected plants to collect pollen.
USDA

Hybrid corn, left and right, produced a good yield despite chinch bugs that ruined a susceptible strain, center.
FUNK BROS. SEED CO.

USDA

To develop a hybrid, pollen from one selected parent corn plant is applied to the silks of another parent plant.

Hybrid corn, in background, has proved superior to open-pollinated varieties, foreground, in ability to withstand wind.
PIONEER HI-BRED CORN CO.

COMMON DISEASES OF CORN

COMMON NAME	CAUSATIVE ORGANISM	DISTRIBUTION
Bacterial Wilt or Stewart's Disease	*Xanthomonas stewarti* (Bacterium)	Widespread. Most damaging in central and east central states
Charcoal Rot	*Macrophomina phaseoli* (*Sclerotium bataticola*) (Fungus)	Found most in the Great Plains area; found locally where hot dry summer weather prevails
Diplodia Stalk Rot	*Diplodia zeae*, *Diplodia macrospora* (Fungus)	Widespread in humid areas; encountered especially in the corn belt
Gibberella Stalk Rot	*Gibberella zeae* (Fungus)	Widespread in humid areas, severe cases ranging somewhat farther north and east than Diplodia stalk rot
Northern Leaf Blight	*Helminthosporium turticum* (Fungus)	Distributed throughout humid areas. It occurs especially in the more humid part of the corn belt
Southern Leaf Blight	*Helminthosporium maydis* (*Cochliobolus heterostrophus*) (Fungus)	Distributed principally in the southern states
Root Rot	Species of *Pythium* and *Phytophthora* (Fungus)	Generally distributed but especially prevalent in humid areas where corn is grown
Ear Rot; Diplodia or Dry Ear Rot	*Diplodia zeae* (Fungus)	Generally distributed in humid areas where corn is grown
Pink Ear Rot; Fusarium	*Fusarium moniliforme* (*Gibberella fujikuroi*) (Fungus)	Generally distributed in humid and semi-humid areas where corn is grown
Red Ear Rot; Gibberella	*Gibberella zeae* (Fungus)	Generally distributed but follows no set pattern; especially prevalent in eastern United States and Kenya, Africa
Seed Rot; Seedling Blight	Species of *Pythium*, *Fusarium*, *Penicillium*, and *Diplodia zeae*	Generally distributed but found especially where corn is planted in cool soil
Smut	*Ustilago maydis*, *Spacelotheca reiliana* (Fungus)	Occurs wherever corn is grown
Rust	*Puccinia sorghi*, *Puccinia polysora* and *Angiospora zeae* (Fungus)	Widespread. Found principally where rain is abundant
Minor Diseases	Diseases of more or less local importance are: Nutritional deficiency diseases, black-bundle disease, crazy top, bacterial leaf spots, head smut, mosaic, physo-	

COMMON DISEASES OF CORN (Continued)

SYMPTOMS AND EFFECTS	CONTROL
The disease is especially damaging to susceptible sweet corn varieties. Leaves have long yellow stripes and plants are dwarfed. Some plants die before tasseling; others die progressively, tassels first, then the leaves, with little or no yield of corn. Field corn is attacked less severely, the disease occurring principally as local elongated dead areas along the veins of the leaves. This sometimes results in premature death of plants	The use of resistant varieties of sweet and field corn. The disease is aggravated where the soil is low in potash
The disease becomes noticeable as plants approach maturity. The base of the stalks becomes discolored, often ash-gray, and the interior becomes rotted. Many tiny black dots appear on the fibers and pith. The plants die prematurely and are very apt to break down	No satisfactory control is known. There is usually little damage in the northern part of the corn belt or in good soil with plentiful moisture
A brown discoloration occurs on the surface of one or several internodes, usually near the ground, sometime after pollination. The rot may involve the entire cross section of the stalk, causing the plant to die prematurely. These plants may suddenly resemble frosted plants. The rotted area then becomes shredded and hollow, and numerous dark brown dots appear on the outer surface. In these dots the spores of the fungus are borne. These dots cannot be scraped off. Diseased plants such as these have lightweight ears and are apt to break down before harvest	Hybrids resistant to stalk rot are used. Avoid thick planting
Very similar to Diplodia stalk rot in appearance and effects. After rot has progressed far enough to kill plants, some pink may show in the stalk interior. Fruiting bodies of the fungus are tiny black dots near the nodes that can be scraped off easily	Use of more resistant hybrids. Avoid thick planting and heavy use of fertilizers, especially nitrogen
Elliptical blotches 1 to 6 inches long appear on the leaves, with concentric zones of different shades of brown. These blotches may fuse, forming larger dead areas. The symptoms usually become most prominent after the middle of the season. Plants may die prematurely, resulting in "chaffy" corn	Hybrids resistant to leaf blight are used
Similar to above. However, the spots are much smaller, averaging less than half the size of northern leaf blight	Same as above
Roots may be attacked at any stage of development. This disease is especially serious in sweet corn, when rains at the first part of the season cause soil to become wet and remain so for some time. Plants may have yellowish leaves with dry tips. The small feeding roots disappear and larger roots become brown. Lodging may occur in the latter part of the growing season. This condition is not to be confused with rootworm damage	Disease resistant varieties are used. Soil fertility is maintained and balanced, especially with respect to potash. Soil is kept loose and well aerated. Less trouble seems to occur after a planting of soybeans
Husks may turn dry several weeks after pollination. The entire ear becomes a dry, grayish mass, light in weight, and of no value. The rot may develop later as a white mold that envelops the ear from the butt to the tip end. It may kill or discolor the seed, either wholly or partially. Some lightly infected seed will grow but may succumb to seedling blight. Ear and stalk infection by this fungus are independent	Use of resistant hybrids when available. Resistance to stalk rot (caused by *Diplodia zeae*) has no relation to ear rot resistance
The disease occurs as scattered single kernels or groups of kernels with pinkish discolorations of various hues. Often a powdery mold is present. Kernels may or may not be cracked open. Pink ear rot is especially likely to occur when ears sustain early injuries by worms or birds, although infection is not limited to such injuries	Use of resistant hybrids when available. Good husk covering is important. It is also necessary to have good balanced soil fertility
A light red rot starts at the tip of the ear, rotting all the kernels as it progresses. Seldom does it involve the whole ear. It is toxic to some animals; a small amount of diseased kernels in the feed will cause hogs to refuse it. Lightly infected kernels used as seed may result in seedling blight	No satisfactory control is available. However, seeds are treated with proper fungicide for the control of seedling blight
Plants fail to emerge or may be sickly after emergence. They have yellowish outer leaves which start to die at the tips. Such seedlings may either die or recover, resulting in weak plants. In some cases the seedlings may be weak without any other definite above-ground symptoms	Seed is treated with a recommended fungicide and is not planted until the soil is sufficiently warm
Galls are produced on any of the above-ground parts. The largest galls may be 4 inches in diameter and occur on stalks and ears. At first the galls are glistening white on the outside and greenish white on the inside. Later the interior becomes black as it turns to an almost solid mass of spores. The surface is usually somewhat convoluted or irregular	Resistant hybrids are used. Excess nitrates in the soil are avoided
Black, brown, or orange spots appear on the leaves. If the plant is severely infected, the result is withering, and premature death. Less severe infections reduce yield.	Resistant hybrids are used

derma brown spot, purple sheath spot, rust, several other kinds of ear rots, and several other fungus and bacterial stalk rots

BENJAMIN KOEHLER

seed, while in Iowa and Illinois, the two chief corn producing states, open-pollinated corn passed out of commercial importance.

Cultivation. In the corn belt, planting begins in the late spring or early summer. The corn is planted on a well prepared seedbed and must be cultivated at least twice to remove weeds. By midsummer it is growing with tropical luxuriance and is then "laid by" until harvest. It is harvested in the fall by hand or by mechanical corn pickers and the husks are removed. Because of its tropical nature the corn is not fully dried at this time and must be stored in carefully ventilated bins or corncribs while much of the remaining moisture is slowly eliminated.

Milling. Corn may be milled in various ways. The seed coat may be soaked off to produce hominy or the entire grain may be milled much as are wheat and other grains. In the wet-milling process the kernels are steeped in hot water to separate the oily germ from the starch endosperm. The former is used for a variety of purposes, principally as a high-grade cooking oil. The latter is marketed as starch, corn sugar, corn sirup, and a great variety of lesser products. The end products vary from plastics to adhesives and industrial alcohol but much of the output is used by bakers and candy manufacturers.

Because of its variability and adaptability it is difficult to imagine ultimate limits to corn's usefulness. A strain with a waxy endosperm, which originated in the Orient, was long known as a scientific curiosity. During World War II this waxy characteristic, transferred to a hybrid corn-belt variety, became of commercial importance as a substitute for tapioca in both its industrial and domestic uses. Before the coming of Columbus, the civilizations of the New World had special strains of corn which were used as sources of sugar, and others with brilliant color that were used as food coloring or in dyeing textiles and baskets. Modern Americans have not yet reached the point of taking full advantage of the variability of this remarkable grass.

Corn is one of the chief sources of cheap molecules of starch. It will produce more useful molecules per man-hour per acre than will any other crop except possibly the grain sorghums. The modern industrial chemist needs something besides air and water if he is to work his miracles. Sometimes he uses coal; frequently he starts with corn sugar. Though corn is raised by high-priced labor, it competes in the industrial market with tropical products such as molasses, which are produced under a tropical environment and for the most part by low-priced labor. It has accordingly been bred to take a great deal from the soil, and it requires good soil and skilled attention for optimum production.

Diseases and Pests. Corn is so variable and grows in so many different environments that no one pest is of universal importance. Probably the commonest and certainly the most conspicuous disease is corn smut, which produces unsightly tumorous growths on almost any part of the plant. In Mexico these growths are gathered and eaten as a kind of mushroom. The European corn borer, which became a great pest in the corn belts along the Danube River, reached the United States about 1910 and spread gradually westward and southward. While it has done much damage locally, the introduction of parasitic insects and diseases, and the development of cultural practices which tend to eliminate overwintering individuals, have helped to keep the corn borer in check.

Uses of Corn. Corn plays a predominant but little recognized role in American life. Whereas in Central America the bulk of the corn crop is used directly as human food and forms the daily bread of the population, the opposite is true in the U.S. corn belt. Since World War I about three-fourths of the American corn crop has remained on the farm where it was grown, largely as food for hogs, for fattening cattle, and to a lesser extent for other animals and poultry.

PURDUE UNIVERSITY

Corn smut, a common fungus disease, is most difficult to eliminate because of its air-borne spores. It is best controlled by the planting of disease-resistant hybrid strains.

Since only a minor fraction of the crop reaches the ultimate consumer as a recognizable corn product, it is customarily thought of as a money-maker for the farmers rather than appreciated as a great natural resource. On the average, every man, woman, and child in the United States uses about eight large ears of corn every day of the year. They come to him as bacon, ham, lard, beefsteak, milk, eggs, salad oil, candy bars, mucilage, bakery goods, breakfast food, laundry starch, and a variety of other products.

In the twentieth century corn has played a remarkable role as a tool of biological investigation. Because of its variability and its ease of crossing, corn was used as experimental material in the earliest scientific studies of plant heredity. The details of its laws of inheritance are now known in more detail than are those of any other plant. As a result, corn is often used as a medium for scientific investigation because of the precise biological controls which can be achieved by the use of specially bred experimental strains.

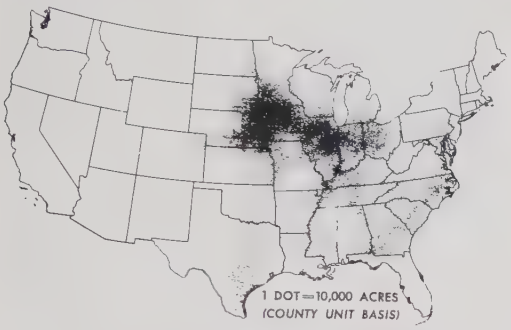
Industrially a portion of the corn crop is used for food products which the public recognizes as corn, hominy, corn meal, corn flakes, and the like. In the wet-milling process, however, the kernel is broken down into its main components and the ultimate products are so different from a kernel of corn that few people realize the connection. By an overnight soaking in hot "steep water," the hull is removed, dried, and ground for use as stock feed. The oily germ floats away and is pressed to remove the oil, one of the world's finest salad oils. The steep water itself, enriched by various substances from the kernel, is an excellent medium in which to grow yeast commercially, or some of its more valuable contents may be extracted directly.

It is the remaining endosperm, however, with its heavy load of starch amid a fine protein network which forms the basis of the chief industry. Washed and purified, this becomes commercial starch, used in the home kitchen and the industrial bakery alike. Treated in a slightly different fashion, it is sold as laundry starch, or after still different treatment is used for binding the sand in iron foundries. The proteins and other minor components of the kernel emerge in a variety of by-products. See STARCH.

American industry uses cornstarch in a multitude of minor ways. Whenever something a little sticky

is needed in a manufacturing process, cornstarch or one of its derivations is apt to be chosen because of its price and purity. Thus one finds a corn product in the mucilage on postage stamps, in the surface finish on paper, or in the binding of explosives. Part of the starch is immediately converted into sugar and sold either as corn sugar or corn sirup. In this form it is the backbone of the American candy and baking industries, the largest direct consumers of corn products. During World War II more than one-fourth of the candy sold in the United States was made from corn products, a practice highly approved by many dietitians since corn sugar is thought to be more easily digested than many other sweets. Pure corn sugar, or dextrose is used by the medical profession in a variety of ways.

Since World War I more than 50 million bushels of corn every year have reached the U.S. consumer in a variety of useful and essential products—vitamin tablets, window shades, asbestos paper, ice cream, vinegar, alcoholic beverages, fireworks, face powder, and many others.



U.S. BUREAU OF THE CENSUS

Corn Acreage in the Contiguous United States

Production. Since World War II, world production of corn has averaged about 5.5 billion bushels annually, of which the United States has produced an average of about 3 billion bushels per year or almost 60 per cent of the annual total. Many other countries produce some corn, but no nation rivals the United States in output. Other corn-growing countries are Brazil, Soviet Russia, China, Argentina, Mexico, Rumania, Yugoslavia, Italy, and Hungary.

United States production was about 3182 million bushels in 1955, somewhat less than the postwar high of 3682 million bushels in 1948. Corn production has been controlled under various farm programs by the federal government since 1933. As one of the "basic" crops, acreage and marketing quotas have been applied in conjunction with price support payments (see COMMODITY CREDIT CORPORATION). Most of the crop is grown in the corn belt, an area about 900 miles across and 150 to 300 miles wide ranging from western Ohio to western Nebraska, where growing conditions are almost ideal for corn. The leading corn-growing states are Iowa, Illinois, Indiana, Minnesota, Ohio, Nebraska, Wisconsin, Missouri and South Dakota.

EDGAR ANDERSON

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CORNARO, CATERINA, 1454–1510, queen of Cyprus, was born in Venice. She married James II of Lusignan, king of Cyprus, and after his death, 1473, ruled until forced to abdicate, 1489, in favor of the Venetian republic. She then formed a court, chiefly of savants and artists, at Castle Asolo, Treviso.

CORNARO, LODOVICO or **LUIGI,** 1467?–1566, Venetian nobleman, was born in Venice. At the age of 40, having been in ill health for 15 years, he gave up the use of medicines and embraced a strict and frugal diet which restored his health. He told of his experiences in *Discorsi della Vita Sobria*, 1558 (*The Art of Living Long*, 1903).

CORN BELT, region in the N central plains of the United States where corn is the predominant agricultural crop. The region comprises western Ohio, Indiana, Illinois, Iowa, southern Minnesota, eastern Nebraska, southeastern South Dakota, northern Missouri, and northeastern Kansas. The heaviest concentrations of corn are found in Iowa, central Illinois, and along the Missouri River between southern Minnesota and northern Kansas. Favorable climatic conditions are a plentiful supply of moisture in late spring and early summer, sunny, humid summer days and hot summer nights. The region is level and has gray-brown podzolic and prairie soils.

CORN BORER, or European corn borer, is the caterpillar, or larva, of an insect pest, *Pyrausta nubilalis*, that was accidentally introduced from Europe in 1906. Its ravages were first recognized in 1917. By 1952 it had been reported from 37 states east of the Rocky Mountains. Although the borer feeds on a great number of other plants, it does more to corn than to any other crop. It is estimated that the borer caused a peak loss of 314 million bushels of corn in the United States in 1949.

The adult insect is a medium-sized moth with a one-inch wingspread. The borer or larva is about an inch long and flesh-colored, with a dark-brown head and characteristic brown markings on each segment. There are two strains of the insect. One has a single generation each year, the other two or more generations each year. Female moths lay about 400 eggs in clusters of 15 or 20, mainly on the undersurfaces of leaves. The eggs hatch in 4 to 9 days, the newly hatched larvae feeding upon corn tassels, developing whorls, pollen, and other nearby plants. Later they bore into the stalks and ears of the corn. The insect overwinters as a larva, pupates in May or early June, and emerges as an adult moth 10 to 14 days later.

The presence of the European corn borer is detected in the early stages by broken tassels, with brown "sawdust" appearing at the point of breakage. Later, tunnels may be seen in the stalks and ears. Methods of combating the corn borer involve burning stalks to destroy overwintering borers, good cultural practices in raising corn, planting corn strains that are more resistant to the insects, and the use of insecticides. Biological control through the use of imported parasites of the borer do not seem to have been effective.

RUPERT L. WENZEL

CORNBURY, EDWARD HYDE, 3rd **EARL OF CLARENDON,** 1661–1723, colonial governor, was born in England. After deserting the army of his uncle, James II, he gained the favor of William of Orange (King William III), who appointed him governor of New York, 1702. Later in the same year his cousin, Queen Anne, named him governor of New Jersey. Cornbury's administration was marked by his lack of executive ability, his bigotry, his arbitrary policies, and his dissolute habits. In New York he defied the legislature when it sought to curb his fraudulent use of public funds; in New Jersey he accepted bribes and appeared in public in women's clothing. Finally removed from office in 1708, Cornbury was immediately imprisoned in New York for his debts. Upon becoming the third earl of Clarendon, 1709, he paid off his creditors and returned to Eng-

L. P. WATSON

The corn-ear worm, shown above attacking a cotton boll, finds this crop a close second to corn as its favorite food. It is rated one of the major cotton insect pests in the United States. The growing cotton seems to give off odors attractive to the worm, which infests cotton fields in the United States from mid-July through August.

land, where he became a privy councilor, 1711, and envoy extraordinary to Hanover, 1714.

CORN COCKLE is a common annual or biennial weed belonging to the pink family, *Caryophyllaceae*. The corn cockle, *Agrostemma Githago*, has tough, leaflike sepals and large, undivided petals that are shorter than the sepals. It has a hairy stem, and its capsule opens into five teeth. Common in grain fields, it is found among cereal crops in almost all parts of the world. Its tall, graceful habit and large lilac-purple flowers make it one of the most beautiful of corn weeds. It is often cultivated. The genus contains two recognized species.

CORN CRAKE, a European bird of the rail family, *Rallidae* (see RAIL). The corn crake, *Crex crex*, is about 10 inches in length, and varies from brownish yellow to brown and buff in color. The bill is shorter than the head and slightly bent, the tail very short, the legs long and powerful. The harsh cry or call note of the male is generally heard incessantly at night. Unlike the related water rails, the corn crake frequents dry corn and hay fields. It can swim well.

CORNEA, the transparent structure covering the iris and pupil of the eye. The cornea bulges out over the pupil and iris so that it looks like a part of a smaller sphere fitted onto the eyeball. For ideal vision the cornea must be perfectly curved and transparent. Any irregularity in the curvature of the cornea will change the angle of the light rays passing through so that they will not be focused properly, and astigmatism, nearsightedness, or farsightedness may result (see EYE). Any opaque spot in the cornea prevents light rays from entering at that point causing partial blindness. If the entire cornea is opaque, no light can enter the eye, and it is completely blind. Opacities result from scar tissue which forms following injury to the cornea. Any disease that severely affects the eye may produce an ulceration which eventually results in an opacity. Opacities are common following trachoma, congenital syphilis, gonorrheal eye infections, and pneumococcal invasions of the eye. See TRACHOMA; VENEREAL DISEASE, *Gonorrhea;* CATARACT.

Corneal Transplant is a surgical procedure to substitute a section of healthy cornea for a damaged one. This operation does not restore sight except where the interference with vision is due to clouding of the cornea. It cannot restore lost function of the nerve or correct any other condition causing blindness. Successful transplantation of the complete eye has never been achieved in man although it has been accomplished on an experimental scale in lower animals. In making a corneal transplant a portion of normal transparent cornea from the eye of a person recently deceased is transplanted into the eye of a person to replace a corneal opacity. The transplanted tissue transmits sufficient light to give at least partial vision in a limited area.

Eye Bank for Sight Restoration. The cornea to be used as a transplant must be removed immediately after death, and such tissue can be kept only three days. The Eye Bank for Sight Restoration, established in New York in 1945, serves as a center for storage of such tissue. The Eye Bank makes available to hospitals and surgeons a supply of fresh or preserved corneal tissue. It also helps to encourage the extension of knowledge and skill in performing corneal transplants by granting scholarships to ophthalmologists.

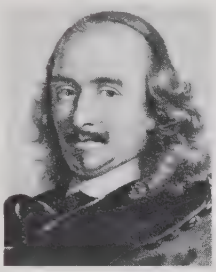
CORN-EAR WORM, also called bollworm, tobacco budworm, or tomato fruitworm, is the caterpillar, or larva, of one of the owlet moths, *Heliothis zea* of the family *Noctuidae*. The common names are descriptive of the plants and plant parts that are injured by the larva's destructive feeding habits. The larva also carries such bacterial diseases as cotton boll rot, and much of its damage to corn ears actually is from the fermentation that follows feeding damage. The caterpillars are from one to two inches in length and vary considerably in color. They may be brown or green with lighter and darker stripes extending the length of the body, or ivory-colored with no markings. Development from egg to adult usually takes about 30 days in midsummer. Corn-ear worms pupate in the ground and overwinter in the pupal stage. Emergence as an adult insect takes place in the spring. In Canada, the insect produces only one generation a year, in northern United States, two, and in southern United States, as many as five or more. Control procedures for this insect depend upon the crop attacked; they include use of insecticide sprays and dusts and poison bait, growing of strains resistant to the pest, and early planting.

RUPERT L. WENZEL

CORNEILLE, PIERRE, 1606–84, French dramatist, was born in Rouen of an old established family of Norman magistrates. The son of an official in the government of Rouen, Pierre lived for 56 years in the provinces, where he led a peaceful bourgeois existence, carrying on civic duties, raising his six children, visiting Paris from time to time, but remaining apart from the fashionable literary salons. At the same time, out of this milieu of bourgeois officialdom, he created the flower of the French heroic theater. Educated by the Jesuits, in 1624 Corneille became, like his father, an advocate for the Rouen parliament; however, he probably never actually pleaded a case before that body. In 1625 he wrote his first poetry, published later in *Mélanges Poétiques* (1632). Continuing his official career in 1628, he purchased two offices: that of king's advocate for the tribunal of waters and forests, and that of advocate for the French Admiralty in Rouen. Between 1629 and 1635 Corneille's dramatic career began to blossom with the production in Paris of several comedies including *Mélite* (1629), *La Veuve*

(1632), *La galerie du palais* (1634), *La Suivante* (1634), and *La place royale* (1635). These were followed by *Médée* (1635), his first attempt at tragedy. With the tragi-comedy *Le Cid* (1636) came his first real public recognition; indeed, the play, based on a work by Guillén de Castro and performed at the Théâtre du Marais, was such an overwhelming success that it provoked much jealousy among Corneille's contemporaries. Included among his critics were Cardinal Richelieu and Mlle. de Scudéry, who induced the newly-formed French Academy to deliver an unfavorable opinion on the play, *Sentiments de l'Académie sur le Cid* (1638), in which it was maintained that the production did not meet the classical standards of the three unities. The public, however, did not read this tract, and continued to consider the play a unique and beautiful work. *Le Cid* stood the test of time and came to be considered one of the greatest of French literary works.

The year 1640 saw Corneille married to Marie de Lampérière, and as well the successful production of two tragedies, *Horace* and *Cinna*, in which he followed classical models more closely than before. Following these were the successful tragedies *Polyeucte* (1643), *La mort de Pompée* (1643), and *Rodogune* (1644); and one of the greatest of his comedies, *Le Menteur* (1644), taken from the Spanish work by Alarcón. In 1647 Corneille was elected to the French Academy, which had previously scorned him. With the tragedies *Héraclius* (1647), *Andromède* (1650), and *Nicomède* (1651) and the heroic comedy *Don Sanche d' Aragon* (1650), he neared the decline of his dramatic powers. In 1650 he resigned his two posts at Rouen and, after the failure of the tragedy *Pertharite* (1652), renounced writing for the stage. Between 1653 and 1656 he devoted himself to work on a verse translation of *L'Imitation de Jésus-Christ*. This retreat ended in 1658 when Fouquet persuaded him to begin writing plays again. In 1662 Corneille moved to Paris, which brought him many domestic cares. Perhaps the biggest disappointment of all was the fact that he was no longer a favorite of the public, whose fickle allegiance had shifted to the younger playwright, Racine. Corneille's first production after returning to the theater was *Oedipe* (1659). It was coolly received, as were *Sertorius* (1662), *Sophonisbe* (1663), *Othon* (1664), and *Agésilas* (1666). At this point Corneille even attempted to imitate the popular style of the day, producing the heroic comedy *Tite et Bérénice* (1670) only eight days after the production of Racine's *Bérénice*. In 1671 he did *Psyché*, a tragic ballet written with Molière, Quinault, and Lulli, which was moderately successful. His last tragedy was *Suréna* (1674).



Pierre Corneille

Corneille was a man of simple habits, shy, ill-at-ease in company, and modest in his relations with others. The great message embodied in his works was an elevated appreciation of the human will which, he felt, might be omnipotent if guided by intelligence and reason. He was the creator of French dramatic prose and heroic tragedy, and is considered the father of French comedy.

RACHEL GILBREATH

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CORNEILLE, THOMAS, 1625–1709, younger brother of Pierre Corneille, was born in Rouen. Educated at the Jesuit College of Rouen and the University of Caen, he was strongly attached to his brother, one of the greatest writers of France. Corneille's first French play, *Les Engagements du hasard*, a comedy, was performed in 1647. Although he did not have the genius of his brother, he wrote 42 plays and was a facile, commercially successful dramatist. His *Timocrate* (1656), a tragedy, had the longest run of the century, and *La Devineresse* (1679) brought the highest price. Most of his plays were fashionable comedies of popular appeal, but he is also remembered for his tragedies, *Ariane* (1672) and *Le Comte d'Essex* (1678). In 1685, after his brother's death, he was unanimously elected to succeed him in the French Academy. He was blind after 1704. Corneille's other works include a tragedy, *Bertrand de Cigaral* (1650); a translation of Ovid's *Metamorphoses* (1679); *Bellérophon* (1679), an opera; and *Dictionnaire universel, géographique et historique* (1708).

CORNEL. See DOGWOOD.

CORNELIA, Roman matron, of the second century B.C., was the mother of the tribunes Tiberius and Gaius Gracchus, leaders of the democratic faction in Rome. A daughter of the elder Scipio Africanus, she devoted herself after the death of her husband to the care and education of her 12 children. According to legend, when a visitor asked to see her jewels, she pointed to her children and said, "These are my jewels." The Roman people erected a statue to her with the inscription, "Cornelia, the mother of the Gracchi."

CORNELIAN. See CARNELIAN.

CORNELIUS, a Roman centurion stationed at Caesarea who was received into the Christian church by Peter. His baptism is an important event in Christian history because he was the first uncircumcized Gentile admitted into the new church without observance of Jewish ceremonial law. According to tradition Cornelius became the first bishop of Caesarea. The story of his conversion is told in Acts 10.

CORNELIUS, PETER VON, 1783–1867, German painter, was born in Düsseldorf. He studied and painted in Rome, 1811–19, and joined J. F. Oberbeck as a leader of the German Nazarene group. In 1820 he was commissioned by King Louis I of Bavaria to design frescoes for the Glyptothek in Munich. He went to Berlin in 1841 and executed numerous cartoon mural decorations, regarded as his best work.

CORNELIUS NEPOS. See NEPOS.

CORNELL, EZRA, 1807–74, U.S. financier, philanthropist, and founder of Cornell University, was born in Westchester Landing, N.Y. An associate of Samuel F. B. Morse, he developed an insulator for telegraph wires and organized the Western Union Telegraph Company in 1856. See CORNELL UNIVERSITY.

CORNELL, KATHARINE, 1898– , U.S. actress, was born in Berlin, Germany, of American parents. She first gained recognition in London for her portrayal of Jo in *Little Women*, 1920, and won critical acclaim in New York for her role in *A Bill of Divorcement*, 1921. Her most notable achievement was the role of Elizabeth Browning in *The Barretts of Wimpole Street*, which had a run of over 700 performances. She wrote *I Wanted to Be an Actress* (1939), and has been starred in such plays as *The Green Hat*, *Romeo and Juliet*, *Saint Joan*, *The Wingless Victory*, *The Constant Wife*, and *The Dark Is Light Enough*.

CORNELL COLLEGE. See COLLEGES.

CORNELL UNIVERSITY, Ithaca, N.Y., is a nonsectarian, coeducational institution of higher learning supported by both endowment and state funds. It was founded in 1865 by Ezra Cornell, who donated $500,000 and 200 acres of land. His largest contribution, however, resulted from his purchase and management of the bulk of New York state's share of the federal land-grant allotted the institution under the Morrill Act. (See MORRILL ACT OF 1862.) Cornell bought scrip representing 913,920 acres at the market price of 60 cents an acre, and under an agreement with the state was bound to sell and devote all profits of the sale to the university. The agreement provided

CORNELL UNIV.

One of the nation's outstanding educational institutions, Cornell University is perhaps best known for its schools of home economics, agriculture, and veterinary medicine.

that the separate fund thus created should be exempt from Morrill Act restrictions which required that colleges founded under its grants be established to teach agriculture and the mechanic arts. The sale of western lands under this agreement subsequently increased the university endowment by about $5 million.

Andrew D. White, first president of the university, worked with Cornell to secure legislation for its establishment. As the initial head of the school, he instituted radical innovations in the curriculum, bringing the arts and sciences under one faculty, permitting freedom of choice among various courses, and placing modern language and literature on a level with political science and history.

The endowed divisions of Cornell offering undergraduate instruction are the college of arts and sciences; the college of architecture; the college of engineering (chemical and metallurgical, civil, electrical, mechanical, and engineering physics); and the school of hotel administration. The state-supported undergraduate divisions are the colleges of agriculture, home economics, and veterinary medicine, and the school of industrial and labor relations. Other divisions include the graduate school; the medical college; the graduate school of business and public administration; the school of education; the school of nutrition; and the graduate school of aeronautical engineering. In 1927 the Cornell College of Medicine became affiliated with New York (City) Hospital; it includes the Cornell University–New York Hospital School of Nursing. The New York Hospital–Cornell Medical College Association occupies a group of buildings, completed in 1932 at 1300 York Avenue along the East River in New York City. See COLLEGES.

CORNER, a market condition resulting from private control over the supply of a commodity or shares of a stock for the purpose of driving up prices and securing large gains in the process. In futures trading of such commodities as cotton, wheat, or soybeans, the manipulators of the scheme secure control of as much as possible of the future supply for the period so that if many traders follow the same course, a corner is created. When the time for delivery arrives, the short sellers (those who agree to deliver at future dates because they contemplate favorable prices) find that they cannot obtain supplies to fulfill their contracts except from the manipulators at their own prices. Similar situations have occurred in the history of the stock market. An unintentional corner may result from rival combinations seeking to control the same stocks, as in the case of the Northern Pacific Railroad in 1901.

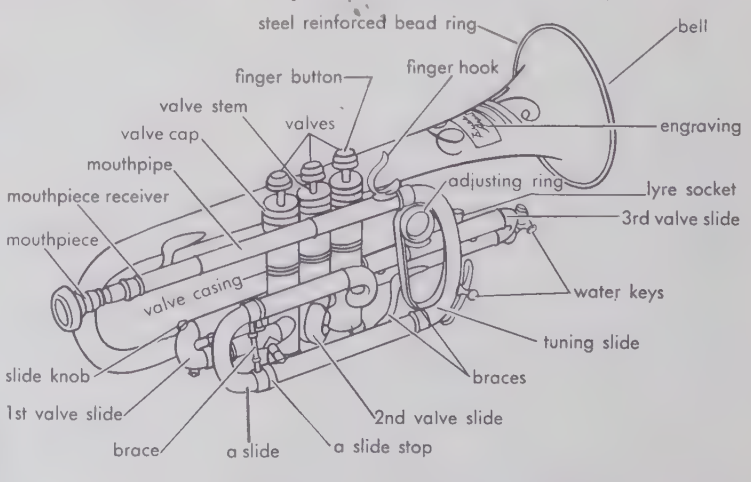
Perhaps the most famous corner in the financial history of the United States culminated on Friday, Sept. 24, 1869, known as "Black Friday," in the attempt of Jay Gould and James Fisk to corner the gold supply. The secretary of the treasury broke the corner by releasing gold from the United States treasury. See FISK, JAMES; GOULD, JAY.

CORNER BROOK, town, including the villages of Corner Brook East and Corner Brook West, E Canada, in the province of Newfoundland, on the Humber River, on the Canadian National Railway; about 260 miles WNW of St. John's. The major industries of Corner Brook, pulp and paper milling and lumbering, are in the village of Corner Brook East. There are also cement and gypsum industries. The town has a deep-water port and ships newsprint and other paper. The Humber valley is the site of the Deer Lake hydroelectric plant. Corner Brook West has furniture and foundry industries. Pop. (1951) 10,276.

CORNET, formerly the lowest ranking commissioned officer in a cavalry troop, who carried the cornet or standard. The rank was abolished in the British army in 1871. In the United States there were cornets in the light dragoons and legionary cavalry of the Revolutionary War and in the light dragoons organized in 1792. In 1799 cornets were designated second lieutenants, but were redesignated cornets in 1800. The rank continued in such organizations of light dragoons as existed until that branch was abolished from the regular army in 1815.

CORNET, a valved brass wind instrument, a descendant of the post horn. In France in about 1800 the post horn was provided with a set of *crooks*—little pieces of brass tubing which, when placed between the mouthpiece and the conical brass tube, chromatically lowered the tone. Later the instrument was fitted with valves and slides so that it could be played in various keys; at this time it came to be called *cornet-à-pistons* to distinguish it from the valveless brass horn, the *cornet-ordinaire*. The first cornet-à-pistons appeared in concert halls in the 1830s and soon became popular with composers because brass sections could be made to play "chromatic trebles"—tones formerly available only through the use of valved trumpets and keyed bugles. Performers quickly took up the new instrument, which combined the brassy tone of the post horn with the versatility of the valved trumpet and the trombone.

The most commonly played cornet, the B-flat, has a compass of two and one-half octaves, with E below



BUESCHER BAND INSTRUMENT CO

Cornet, Indicating the Important Mechanical Parts

middle C as the lowest note; intermediate tones are produced by means of three slides which lengthen the tube. Three pistons, depressed at will by the fingers of the performer, control the mechanism which admits air to the slides: the first lowers the pitch a whole tone; the second, a semitone; and the third, three semitones. The crooks produce corresponding chromatic alterations in pitch.

CORNETO TARQUINIA. See TARQUINII.

CORNFLOWER. See BACHELOR'S BUTTON.

CORNICE, in architecture, is the projecting molding which crowns the topmost section of a structure. It may be a projecting course of masonry at the top of a building which forms a decorative railing around the roof or merely a decorative molding topping the entablature. A molding that covers the angle formed by wall and ceiling is also a cornice. In interior decoration a cornice is a valance-like board fixed across the top of a window to conceal the top edges of curtains, drapes, and blinds. It may be covered with fabric, painted, or treated in other decorative ways.

CORNICHE. See RIVIERA.

CORNING, city, S central New York, in Steuben County, on the Chemung River, on the Erie, the Delaware, Lackawanna and Western, and the New York Central railroads, and on state highways 17 and 414, 75 miles SSE of Rochester. The leading industry in Corning is the manufacture of glass, especially Pyrex ware, bulbs, laboratory and pharmaceutical apparatus, neon tubing, optical and astronomical lenses, and electronic equipment. In the Corning Glass Center is a museum of glass crafts and glassware, glassmaking shops, and the first casting of a 200-inch telescope mirror. Other industries include fiber box and air compressor manufacturing. Pop. (1950) 17,684.

CORN ISLANDS, two small islands, Great Corn and Little Corn, in the Caribbean Sea, off Bluefields, Nicaragua. The Corn Islands are in a strategic location near the Nicaragua Canal (see NICARAGUA CANAL) and have been leased for 99 years to the United States by Nicaragua under the Bryan-Chamorro Treaty of 1916. The principal industry of the islands is the production of coconuts. Pop. (1950) 1304.

CORN LAWS, the restrictions and duties placed by the government of Great Britain on the import and export of grain, especially wheat, known as corn in England. As early as the twelfth century the exporting of grain was forbidden, although royal licenses were granted to supersede the order. Laws of 1436 and 1463 allowed exporting without a license when the price fell below a stated level, and forbade imports in the same circumstance. The intention was to limit speculation, and to encourage production by providing a stable price profitable to the growers. Such laws, with variations, continued through the period of the Tudors and Stuarts, while the price of grain was affected largely by currency inflation and changed agricultural methods. Under Charles II in 1670 a sliding scale of duties on imported grain was provided, the duty decreasing as the price of domestic grain rose. Under William and Mary bounties on the export of grain were provided and continued into the eighteenth century. The duties were lowered in 1773. The fall in prices after the high levels of the Napoleonic Wars brought demands from farmers and landowners for protection. Laws of 1814 and 1815 ended the bounties on exports but provided duties, which revisions of 1822 and 1828 placed on a sliding scale.

It was against these measures that vigorous agitation was conducted, on the ground that they benefited the landed aristocracy at the expense of the urban classes and especially the laborers. The Anti-Corn Law League, founded in 1839, organized the agitation and, under the leadership of Richard Cobden and John Bright, conducted a wide and persistent campaign of meetings, pamphlets, and other publicity, which was successful especially among the middle classes. The theories of the economists provided influential arguments. The campaign concentrated on the single issue of repeal of the duties, refusing to consider compromise or to deal with other issues, and insisting on nonpartisanship. In 1845 the agitation convinced Sir Robert Peel, the conservative prime minister, who had already supported measures of tariff reduction leading to free trade. A poor harvest in 1845 and the Irish potato famine beginning in 1846 persuaded Peel of the timeliness of repeal of the Corn Laws. He supported a measure for the gradual reduction of the duties over three years so that by 1849 there would be only a registration fee for the port of grain. The passage of this repeal occasioned a division in the Conservative party, and Peel lost office. See GREAT BRITAIN, History; PEEL, SIR ROBERT; COBDEN, RICHARD; BRIGHT, JOHN.

CORNO, MONTE. See APENNINE MOUNTAINS.

CORNOUAILLE or **CORNOUAILLES,** historical region of France, in SW Brittany. The name derives from Britons who fled Cornwall and settled the region about 500. In the Middle Ages the county of Cornouaille had its center at Quimper.

CORN PICKER. See FARM MACHINERY, *Corn Picker.*

CORN PLANTER. See FARM MACHINERY, *Planting Machines.*

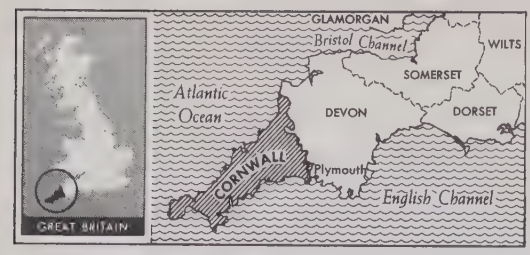
CORN SNAKE, a harmless, brightly colored common snake of eastern United States. A member of the family *Colubridae* that also includes the racers and garter snakes, the corn snake, *Elaphe guttata,* is brownish red with lighter red blotches bordered with black. This snake is usually 3½ to 4 feet in length, but specimens up to 6 feet have been reported. Its food consists of rodents and birds.

CORNWALL, BARRY. See PROCTER, BRYAN WALLER.

CORNWALL, city and port of entry, SE Canada, in the province of Ontario, county seat of Stormont County, on the St. Lawrence River and the Cornwall Canal, at the Canadian end of the Roosevelt International Bridge connecting Ontario with New York; on the Canadian National, the Canadian Pacific, and the New York Central railroads and Canadian Highway 2; 54 miles SE of Ottawa. Cornwall has river dock facilities and manufactures textiles, paper, furniture, and chemicals. The surrounding agricultural region has general farming and dairying. Cornwall was founded as Johnstown by Loyalists in 1784. Pop. (1951) 16,899.

A panorama of the glassmaker's creative and decorative techniques from 1500 B.C. to modern times chronologically unfolds before visitors at the Corning Museum of Glass.

CORNING GLASS WORKS



Location Map of Cornwall

CORNWALL, county, SW England, bounded by the Atlantic Ocean on the N, Devonshire on the E, and the English Channel on the S; area 1357 sq. mi.; pop. (1951) 345,612. Cornwall is the most southwesterly portion of England and forms an irregularly shaped peninsula some 75 miles long. It terminates in the two promontories of Land's End and Lizard Point. The Scilly Islands, 28 miles to the southwest of Land's End, are part of Cornwall. Much of the county consists of bleak moorland broken by wide, fertile valleys. Bodmin Moor, in eastern Cornwall, is the largest tract of moor and includes Brown Willy (1375 ft.), the highest point in the county. From east to west the principal streams are the Tamar, Fowey, Camel, and Fal rivers. The coast line is generally rugged and steeply cliffed. It contains many indentations, among them Fowey and Falmouth bays on the south coast, and St. Ives and Padstow bays on the north. Cornwall enjoys the mildest climate in England and favored locations, particularly the Scilly Islands, can grow subtropical vegetation. More extreme conditions prevail in the uplands. Leading crops in the county are oats, wheat, barley, and potatoes. Market gardening and flower growing are very important, particularly in the Scilly Islands. Dairying and fishing are other major occupations. The most important mineral is tin, produced mainly in the Camborne-Redruth area; kaolin, slate, granite, lead, copper, and tungsten are also produced. Bodmin is the county seat. Other major centers are Truro, Camborne-Redruth, Falmouth, Penzance, and St. Ives. Cornwall's noted scenic areas and mild climate draw many tourists; the quaint fishing villages and rugged coasts are particularly attractive. There are numerous prehistoric relics and ancient buildings in the county, including many medieval castles. It is believed that the Phoenicians visited the area to trade for Cornish tin. The people of Cornwall are largely descendants of Celtic settlers. The Cornish language did not become extinct until the end of the eighteenth century; some Cornish expressions survive in local speech. The eldest son of the British royal family has the title of duke of Cornwall.

Land's End in Cornwall, most westerly point in England, is formed of high granite cliffs fantastically carved by erosion. A mile offshore is the Longships Lighthouse.
BRITISH INFORMATION SERVICES

CORNWALLIS, CHARLES, 1st MARQUIS, 1738–1805, son of the first Earl Cornwallis, was born in London. Educated at Cambridge University, he was elected to the House of Commons, 1760, and fought in Germany, 1761–62. Although Cornwallis was opposed to the crown policies that provoked the American Revolution, he went to America in 1776 as a major general and distinguished himself under Sir William Howe and Sir Henry Clinton in New York, New Jersey, Pennsylvania, and the South, 1776–79. Given command in South Carolina, Cornwallis decisively defeated Gen. Horatio Gates at Camden, Aug. 16, 1780. He also gained a nominal victory over Gen. Nathaniel Greene at Guilford Court House, Mar. 15, 1781; however, British losses were such that Cornwallis withdrew to Virginia. Surrounded at Yorktown, he was forced to surrender to Gen. George Washington, Oct. 19, 1781. See CAMDEN, BATTLE OF; GUILFORD COURT HOUSE, BATTLE OF; YORKTOWN, SIEGE OF.

Cornwallis was sent to India in 1786 as governor general and commander in chief of the army and sought to further the natives' welfare through civil and military reform. With the outbreak of the Third Mysore War, he campaigned against Tipu Sahib, sultan of Mysore. After capturing Bangalore, Cornwallis forced the sultan to surrender at Seringapatam, 1791, and to give up half of his territory. Created a marquis, 1792, Cornwallis was promoted to general and returned to England in 1793. In 1798 he was appointed viceroy of Ireland, where he put down a rebellion, repelled a French invasion, and negotiated a peace settlement that gained the good will of both Catholics and Orangemen. He also was instrumental in having the Act of Union, providing for a unified Irish and British government, passed by the Irish parliament, 1800. He resigned his post in 1801 when the British refused to grant Roman Catholic emancipation. Cornwallis negotiated the Treaty of Amiens, 1802, and was reappointed governor general of India, 1805.

CORNWALLIS ISLAND, in the Parry Islands, N central Canada, in the Northwest Territories, in the central part of Franklin District, in the Arctic Ocean, between Baillie-Hamilton Island on the N, Barrow Strait on the S, Wellington Channel and Devon Island on the E, and Bathurst Island on the W. On the southwestern coast is a joint U.S.–Canadian weather station. Area 2670 sq. mi.

CORO, city, NW Venezuela, capital of the state of Falcón, at the base of the Isthmus of Médanos, 205 miles WNW of Caracas. Coro is the market and commercial center of a livestock-raising region. It is connected by railroad with the Caribbean port of La Vela. Commodities shipped from La Vela, after marketing and processing in Coro, include hides, skins, coffee, corn, and lumber. Coal and salt are mined in the vicinity of the city. Coro was founded in 1527 and was an important base for early colonial expansion. Pop. (1950) 29,341.

COROCORO, city, W central Bolivia, in the department of La Paz, capital of Pacajes Province, in the Bolivian Altiplano; 55 miles SSW of La Paz. Corocoro is an important mining center for native copper. Pop. (1950) 4431.

COROLLA. See FLOWER.

COROLLARY, in geometry, is a theorem or proposition that is so readily apparent from the proof of some other theorem that it needs very little, if any, proof. For example, if the base angles of a triangle are equal, the sides opposite them are equal. See GEOMETRY.

COROMANDEL, city, E Brazil, in the state of Minas Gerais, 25 miles SE of the state border of Goiás and 235 miles WNW of Belo Horizonte. Coromandel is a diamond and platinum mining center. Pop. (1950) 2689.

COROMANDEL COAST, E coast of India, facing the Bay of Bengal, Andhra and Madras states,

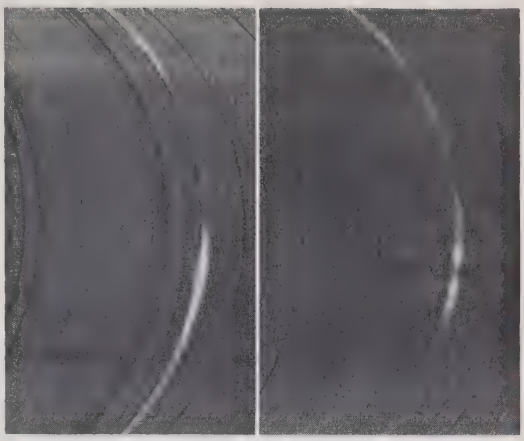
extends from the Kistna River on the N to the Palk Strait on the S; length of coast line about 450 miles. It is a generally level flood plain and includes the mouths of the Palar, the Penner, and the Ponnaiyar rivers. The coast has no natural harbors, but its chief ports are Madras, Pondichery, Cuddalore, and Negapatam.

CORONA, city, S California, in Riverside County, on a tributary of the Santa Ana River, on the Santa Fe and the Pacific Electric railroads and U.S. Highway 91; 42 miles ESE of Los Angeles. Principal industries of Corona are fruit packing (lemons, oranges, and avocados) and the manufacture of ceramics and tools. The city is the site of a U.S. naval hospital and a naval ordnance laboratory. Grand Boulevard, a circular drive around the center of the city, marks the townsite boundary established in 1886. Pop. (1954 special census) 11,462.

CORONA, a vast and rather uniform halo of pale white light around the sun, visible during a total eclipse (see ECLIPSE). During the brief moments of a total eclipse of the sun by the moon, two striking features of the sun's atmosphere become spectacularly visible. Only in relatively modern times have astronomers been able to tell with confidence what they are and why they appear as they do. In fact, it was not until late in the nineteenth century that these two features, the prominences and the corona, were conclusively proved to be appendages of the sun and not of the moon. See CHROMOSPHERE.

The corona and prominences differ remarkably in appearance and physical constitution. The prominences are irregularly shaped, rosy-lavender clouds of hydrogen, helium, vaporized calcium, and other gases. The corona, on the other hand, completely surrounds the sun as a rather uniform halo of faint white light. In the outer portions of the corona delicately shaded streamers can sometimes be seen extending to several times the diameter of the sun. Until about 1940 the constitution of the corona remained a total mystery. But photographs and visual observations at eclipses have revealed to astronomers the interesting patterns of the coronal outline and that these patterns changed in regular fashion from eclipse to eclipse—indeed, that the pattern changes conformed roughly to the well-known sunspot changes. See SUNSPOT.

W. J. S. Lockyer classified coronal patterns into a series of uniform gradations between the "polar" pattern, which occurs about two years before the

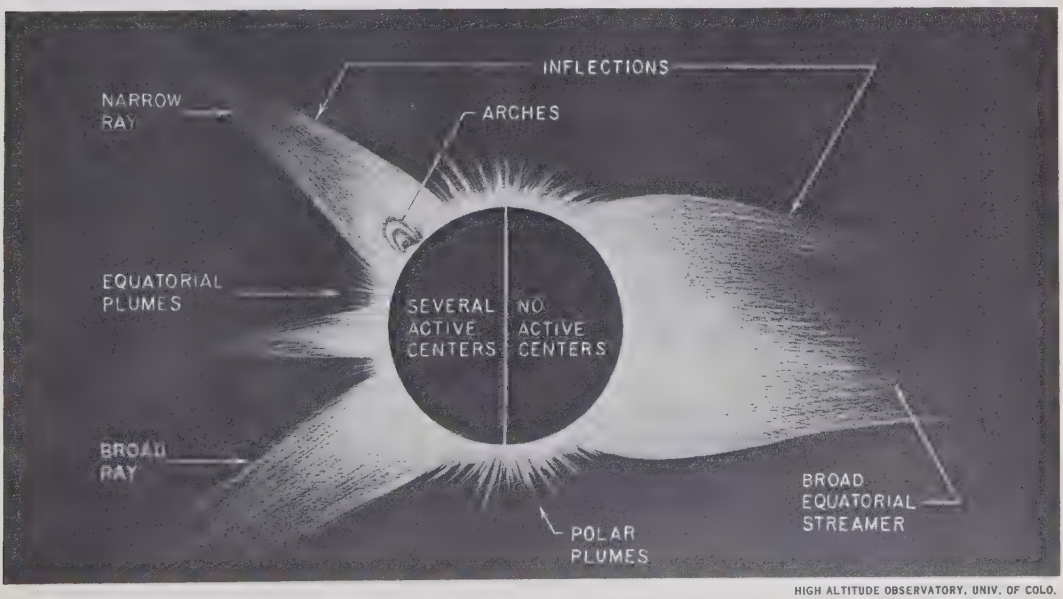


HIGH ALTITUDE OBSERVATORY, UNIV. OF COLO.

A coronal spectrogram shows a green line at 5303 angstroms and a red line at 6374 angstroms. Such lines indicate the presence of highly ionized iron, nickel, and cadmium.

sunspot activity reaches a maximum, and the "equatorial" pattern, which occurs about two years before the sunspots reach minimum activity in their semi-regular 11-year cyclical fluctuation. The polar pattern consists of a general halo, with long streamers radiating at high and intermediate latitudes upon the sun, frequently giving the corona a squarish appearance. The equatorial pattern consists primarily of the general halo with long streamers radiating from a limited zone near the sun's equator. Streamers from the north and south zones near the equator frequently appear to unite. At the time of equatorial corona, small spikes of coronal gases frequently show up strikingly in the vicinity of the poles of the sun.

Coronium. During the nineteenth century astronomers turned their spectroscopes toward the corona during eclipse and found a large number of bright spectral lines superposed on the weaker continuous spectrum of the corona as observable then (see SPECTROSCOPE; SPECTRUM). By 1936 the wave lengths of more than 10 lines had been accurately measured, but not one of these spectrum lines could be identified by comparison with lines from known chemical laboratory spectrograms. Astronomers assigned the name "coronium" to the hypothetical element that



HIGH ALTITUDE OBSERVATORY, UNIV. OF COLO.

Diagram Showing the Coronal Forms Seen During Eclipse in Years of Both High and Low Solar Activity

might ultimately prove responsible for the lines in the coronal spectrum. The true origin of coronium became one of the most fascinating and important problems of astrophysics.

Meanwhile, from 1929 to 1930, a remarkable new type of astronomical telescope, the coronagraph, was developed by Bernard Lyot in France for the specific purpose of studying the sun's corona on any clear day, instead of just at eclipse. (See CORONAGRAPH.) With this instrument Lyot established that the corona changes rapidly from day to day and that its features partake of the rotation of the sun's surface, at least approximately. Lyot further proved that the apparent day-to-day changes were primarily the result of the sun's rotation, because the corona itself was rather stable from week to week, though over a period of months its bright and faint patches of emission altered.

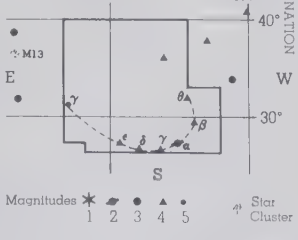
In 1941 Bengt Edlén of Sweden announced that coronium is none other than iron, nickel, and calcium in highly ionized condition (see IRON; ATOM, *The Bohr Atom*). This ionization, Edlén established, is a result of the incredibly high temperature of the corona, in the vicinity of 2 million degrees C. This temperature is so much higher than that of the sun's surface, 6000°C., that a new problem is created—that of explaining the extreme temperature of the corona. Some astronomers believe that these high temperatures are induced by prominences traveling with supersonic speed through the corona.

Corona and Radio Communication. As time passes, supporting evidence for the corona's remarkable temperature is found in such things as the behavior of short-wave radio and radar equipment. During World War II special short-wave radio communication, detection, and navigation equipment became tremendously important. The sun was found to be a primary contributor to the frequent disturbance of these radio devices. At the close of the war the same radio equipment was diverted to the purposes of solar research. The behavior of radio apparatus has been correlated with the day-to-day fluctuations of the corona, sunspots, and solar faculae. (See SUN, *Surface Features*.) There is some evidence that certain kinds of world-wide weather changes accompany the outbreak of strong emission regions of the corona. During the International Geophysical Year (1957–58) a world-wide chain of coronagraphic stations was planned by astronomers to keep accurate day-to-day records of all characteristics of the corona's emission.

W. O. ROBERTS

CORONA, an appendage on the top of some seeds, as in the dandelion or thistle. Corona may also be an appendage on the inner side of the corolla of such flowers as daffodil, jonquil, and milkweed.

CORONA BOREALIS, or the Northern Crown, is an ancient constellation that is on the meridian about 9 P.M. at the end of June. The second magnitude star Gemma (Arabic *Alphecca*), the brightest one in the crown, having a magnitude of 2.3, is an eclipsing double star whose components complete a revolution in 17 days. (See CONSTELLATION; DOUBLE STAR; MAGNITUDE.) Near it are other binary systems η and γ Coronae, whose periods of revolution are about 40 and 100 years, respectively. The system σ Coronae is a triple one; the widely separated pair requires more than a thousand years to make a complete revolution, and the brighter of the two stars is itself a spectroscopic binary revolving in eight days. R Coronae is a remarkable variable star (see VARIABLE STAR). It stays at nearly constant brightness, about fifth magnitude, for years and then drops abruptly to a minimum. The time at minimum is relatively short, and the intervals between successive minima are entirely erratic. The brightness at minimum may be as much as two-thirds that at normal or as little as one-thousandth. T Coronae is that rare phenomenon, a recurring nova (see NOVA). Maximum brightness reached magnitude 2.0 at the 1866 outburst, and magnitude 3.3 during the outburst seen in 1946, a 500-fold increase over the previous low intensity. The light curve of 1946 closely followed that of 1866, with a similar secondary maximum.



Constellation Corona Borealis

CORONADO, FRANCISCO VÁSQUEZ DE, 1510–54; Spanish explorer in America, was born in Salamanca, Spain. He went to Mexico in 1535 as aide to Antonio de Mendoza, the viceroy, and became governor of Nueva Galicia, 1538. In 1540 he was appointed commander of an expedition to explore to the north for vast riches of gold and silver reported to exist in the "Seven Cities of Cibola." After assembling a small army of some 1000 Spaniards and Indians at Culiacán, Coronado proceeded across Sonora and southeastern Arizona into New Mexico, where he found that the treasure of Cibola consisted only of the Zuñi pueblo settlement. Unwilling to admit failure, Coronado sent out three exploration parties, one of which discovered the Grand Canyon. In April 1541 he went in search of another El Dorado called the Quivira. He crossed the Pecos river and that part of Texas later known as the Panhandle to Oklahoma, and as far as Kansas. There he found a settlement of Indians, but no treasure. Disillusioned, he returned to Nueva Galicia, 1542, only to find himself involved in the Indian rebellion, later known as the Mixton War. The Indians were defeated, but Coronado was dismissed for cruelty. After 1544 he lived in Mexico City. Coronado had failed in his search for treasure, but his expedition had opened the Southwest to colonial settlement by Spain.

CORONADO, city, S California, in San Diego County, on Coronado Beach peninsula, between San Diego Bay on the E and the Pacific Ocean on the W; on the San Diego and Arizona Eastern Railway, a branch of the Southern Pacific Railroad; across San Diego Bay from San Diego and part of its metropolitan area. Coronado is a residential and resort city. Pop. (1952 special census) 17,171.

CORONADO NATIONAL MEMORIAL, in SE Arizona, in Cochise County, in the Coronado National Forest, 2 miles north of the Mexican border and 41 miles E of Nogales, Ariz.; an area of 2745 acres containing a scenic region. A view of the route taken by Francisco Coronado's expedition (1540–42) can be seen from Coronado Peak. (See CORONADO, FRANCISCO VÁSQUEZ DE.) The memorial was established in 1952.

CORONAGRAPH, a specialized type of astronomical telescope designed for photographing the sun's corona on any clear day, instead of merely during the rare and brief moments of a total eclipse of the sun by the moon. (See CORONA; ECLIPSE.) A coronagraph produces an artificial eclipse within the instrument itself. The difficulties of photographing the corona without a natural eclipse arise from the fact that the sun's photosphere, or luminous surface, is too intensely bright to permit the very faint corona to be seen when the bright surface is obscured in any simple fashion.

In 1929 the French astronomer Bernard Lyot, at the suggestion of H. O. Barnard, analyzed all means by which unwanted light found its way to the film from the sun's photosphere in an ordinary telescope, thus preventing artificial eclipse photography of the corona. By special optical design Lyot eliminated all reflections of light between faces of the glass of the first lens of the telescope, and also all light diffracted (see DIFFRACTION) from the edge of the main lens. Finding it impossible to meet these requirements in a color-corrected lens, he was forced to use a simple one

made of glass of unbelievable purity and polished with extraordinary care in order to cut down diffusion of light from imperfections. In addition Lyot found it necessary to operate his coronagraph in the pure atmosphere of a high-altitude observatory in the Pyrenees Mountains.

As a result of Lyot's remarkable successes a coronagraph station was set up in 1938 at Arosa in Switzerland under the auspices of the Swiss Federal Observatory at Zurich, and one in 1940 at an elevation of 11,500 feet at Climax, in the Rocky Mountains of Colorado, operated by the High Altitude Observatory of the University of Colorado. Since 1940 coronagraphs have been established in Germany, Sweden, Japan, Russia, and other countries. The world's largest coronagraph, an instrument of 16-inch aperture, is now operated at the Upper Air Research Observatory at Sunspot, N.M.

W. O. Roberts

CORONARY HEART DISEASE is any disease affecting the coronary arteries of the heart so that blood flow to the heart muscle is partially or completely obstructed. The coronary arteries form a corona, or crown, encircling the heart. They are the first vessels to arise from the aorta and supply blood to the heart muscle itself. (See Heart; Arteries, Veins, and Capillaries.) Any hindrance of the flow of blood through these vessels will adversely affect the heart muscle.

Coronary heart disease is rarely the result of congenital abnormalities of the coronary arteries. It sometimes results when inflammation causes chronic lesions of the coronary vessels. Acute and chronic infections such as syphilis, pneumonia, diphtheria, and rheumatic fever may set up such inflammation. Conditions associated with abnormal fat metabolism such as hypertension, diabetes, and gall bladder disease are frequently precursors of coronary heart disease. As is true for other cardiovascular diseases, arteriosclerosis is one of the common causes of lesions of the coronary arteries. See Arteriosclerosis; Cardiovascular Disease.

Sudden or unaccustomed physical or emotional strain can initiate coronary heart disease. Since the function of the coronary arteries is always to keep an adequate supply of blood flowing into the heart muscle, a fine balance must be maintained between the supply and demand. Intense emotion, overexertion, and severe fatigue which make extra demands upon the heart will upset this finely balanced operation. Any sudden physical or emotional strain will increase the demands of the heart muscle and can precipitate a breakdown.

Disease conditions actually affecting the coronary arteries are called coronary spasm, coronary thrombosis, and coronary embolism. Coronary spasm is a strong intermittent contraction of the coronary blood vessels which interferes with the constant flow of blood to the heart. In coronary thrombosis, clots form along the blood vessel wall and narrow its caliber so that ultimately inadequate amounts of blood flow through. Coronary embolism is the occlusion of one of the coronary vessels by a blood clot which has broken away from an inflammatory process somewhere in the body. See Thrombosis and Embolism.

Symptoms of coronary heart disease vary according to the causative factor, but usually include pain in the heart area (see Angina Pectoris), restlessness, an ashen gray color, profuse perspiration, a fall in blood pressure, and eventual shock. Treatment is always aimed at reducing the work of the heart. Bed rest is often advised but is not prolonged. Subsequent activity is usually sharply curtailed. Sometimes drugs are given to alleviate pain and anxiety and to regulate heart action.

Bibliog.–E. P. and N. F. Boas, *Coronary Artery Disease* (1949); W. C. Alvarez, *How to Live with Your Heart Condition* (1950); W. H. Gordon, *What Is Heart Disease?* (1950); C. Y. Harrison, *Thank God for My Heart Attack* (1950); H. M. Marvin and others, *You and Your Heart* (1950); P. D. White, *Heart Disease* (ed. 1951).

CORONATION, the ceremony by which a sovereign is formally invested with the powers of state. From antiquity to modern times such investiture has normally included presentation to the new monarch of a crown or its equivalent by elders, acting as representatives of higher powers into whose hands the crown reverted upon the death of the sovereign. (See Crown.) The coronation or "crowning" was the act by which the sovereign was created, although in the course of history, as succession became more firmly established in terms of heredity, the coronation more and more was a ceremony in recognition of an already accomplished fact. The usual but not invariable elements of coronation ceremonials were the oath (spoken by the successor), anointing with sacred oil (performed upon the successor by an elder), investiture, crowning, enthronization, and homage (granted to the sovereign as an acknowledgment). See Homage; Investiture; Oath.

Almost invariably participants in coronation ceremonials wore special, often elaborate dress as an expression of the magnitude of the occasion. Coronation pageantry, also elaborate, signified the joyous optimism which was supposed to be inherent in the act of welcoming a new ruler. Moreover, coronation ceremonies were made to consume as much time as possible, to signify the deep and lasting significance of the event, with the incidental result that the pomp and pageantry had more time to exert their sensuous and spiritual effect upon all concerned. All of these essential features—elaborate dress, pageantry, and lengthiness—were, of course, relative to the normal procedures of society. When "court life" was normally rude, the ceremony was quite simple compared with the later coronations of European nations in periods when everyday court life was ceremonious in the extreme. Similarly, public sentiment influenced the degree of elaborateness, at least to an extent: Roman emperors received no crown owing to popular feeling against the practice.

Great Britain was the last major state to retain the practice of an elaborate coronation ceremony, its most recent being the coronation of Elizabeth II, in 1953, when the ceremony varied in only minor respects from that set forth in 1307 in *Liber regalis*. The papal coronation service of the Roman Catholic church is, perhaps, the purest survival in modern times of the ceremonial as it was at the peak of its development.

CORONATION GULF, an arm of the Arctic Ocean, NW Canada, in the Northwest Territories in SW Franklin District; bounded by Victoria Island on the N, Queen Maud Gulf on the E, Mackenzie District on the S, and Dolphins and Union Strait on the W. Coronation Gulf is about 130 miles long and from 50 to 70 miles wide. The principal river flowing into the gulf is the Coppermine. The passage was used by Roald Amundsen, 1903–06.

CORONATION ISLAND. See South Orkney Islands.

CORONEA, ancient Greek town, in Boeotia, W of Lake Copais, the scene of two important battles. In 447 B.C. the Boeotians defeated the Athenians, and in 394 B.C. the Spartans under Agesilaus were victors over the Thebans and their allies. See Greece, History.

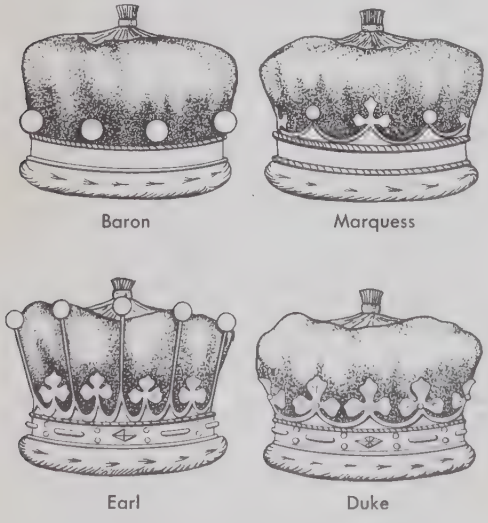
CORONEL, city and seaport, middle Chile, in the province of Concepción, capital of the department of Coronel, on the Gulf of Arauco, near the Bío Bío River; 16 miles S of Concepción. Coronel is a commercial center and coal-shipping port. Pop. (1952) 17,372.

CORONER, a county officer, usually elective, whose principal duty is to inquire, with the assistance of a jury, into the cause of all violent or unnatural deaths, or deaths which occurred in prison or under

suspicious circumstances. Known in England since the twelfth century, the office of coroner has lost much of its original importance. Originally, the coroner kept records pertaining to criminal justice in the county, and collected the goods and chattels of criminals, deodands, treasure-troves, shipwrecks, and the royal fish for the king.

In the United States coroners are usually elected by the qualified voters of the county for a term of two or four years, or are appointed in some states by the governor. The office combines medical and legal duties; the coroner must hold an inquest and furnish the state with a decision on the cause of death whenever there is a reasonable suspicion attending the circumstances of death and must summon a jury of six or more persons where there is evidence of crime. He may seize evidence, summon witnesses, and order the performance of autopsies. In many states the findings of the coroner's jury may lead to the procurement of an indictment. In the absence of the sheriff, the coroner temporarily assumes his duties.

The low-paid office of coroner is usually held by a minor local politician, although some states require that he be a licensed physician. Several states, including those in New England, have abolished the office, dividing the coroner's duties between the medical examiner and the district attorney. Yet the office continues to be of great importance to society in bringing murderers to punishment and protecting innocent parties from accusation.



Coronets of the British Nobility

CORONET, a small crown worn on state occasions by members of the nobility. Coronets worn by British peers were radiated circlets of gold surmounting ermine-trimmed velvet caps. Formerly the decoration of the coronet was decided upon by the wearer, but later usage assigned a definite pattern for each grade of the peerage. Thus a ducal coronet in Great Britain was bordered by eight golden strawberry leaves, that of a marquess by four leaves and four pearls; the coronet of an earl had eight tall rays surmounted by pearls, with strawberry leaves in the intervening spaces; and the baron's had six pearls set into the circlet. In heraldry, the symbol of the appropriate coronet became part of the armorial device of a noble.

COROT, JEAN-BAPTISTE CAMILLE, 1796–1875, French painter of the Barbizon school, was born in Paris. He was well educated and given a start in business by his parents, but detested commercial life. At 26 he persuaded his father to subsidize him, and was able thenceforth to work exclusively at painting.

NELSON GALLERY

Corot's concern with rendering hazy atmospheric effects is apparent in *The Villa of the Parasol Pine*, a romantic departure from his earlier, more classic style of painting.

Corot was largely a self-taught painter; indeed, his formal studies, mostly in classical landscape, lasted only a year. Thereafter he spent his time making sketches and studies from nature. From 1825 to 1828 Corot made the painstakingly minute observations of landscape and architecture in Rome evident in such works as *View of the Coliseum* (1826). Back in France, this tendency was continued in such works as *Chartres Cathedral* (1830). This almost classic style persisted until about 1850, at which time a decided change in mood began to be discernible in his work. A romantic spirit pervaded his landscapes such as *Dance of the Nymphs* (1851); this was the beginning of his "mysterious, poetic" period. Misty atmospheric effects, feathery foliage, and softly filtered light make his forests, seen through a haze of muted color, seem almost enchanted. *The Lake* (1861) and *The Windblown tree* (1865) are typical of this style. During this time his work became immensely popular and he sold almost every canvas he painted. During his later years Corot turned to figure painting, and produced several studio portraits such as *The Gypsy* (1865) and *Woman with Pearls* (1870), which approach impressionism in their purity of color and rendering of planes. Corot's popularity diminished after 1900, but critics 50 years later rediscovered the purity of composition and classic simplicity of his early work, and the monumental conception of form which embodied his late paintings. The overly romantic landscapes of the middle period, so highly regarded in his lifetime, came to be considered a deviation. F. D.

CORPORAL, a noncommissioned officer found in nearly all the armies of the world. In the U.S. Army a corporal is the lowest ranking noncommissioned officer and wears as his insignia a chevron with two stripes. See Noncommissioned Officer.

CORPORAL PUNISHMENT, the infliction of direct bodily pain in retribution for a criminal act. In early times, corporal punishment was meted out both as a punishment for the crime committed, and as a deterrent to subsequent criminal acts. Although opinions on its efficacy differ, it is widely held that, contrary to early beliefs, it does not act as a deterrent to criminal behavior. History and numerous studies have confirmed the fact that severe bodily chastisement has never reduced criminality to any marked degree.

Until the close of the eighteenth century most punishment, with the exception of exile and composition (or the payment of a sum of money as satisfaction for a wrong or a personal injury), took the form of corporal punishment. The most brutal methods included mutilation, early employed in connection with *lex talonis*, or the law of retaliation, which required infliction upon the wrongdoer of the same injury he caused to another. Common in late oriental and classical societies was the branding of war prisoners, slaves, and criminals. Criminals of American colonial times were also branded: in the East Jersey codes of

1668 and 1675, for example, it was ordered that the first burglary offense was to be punished by branding on the hand; for the second offense, a brand was put on the forehead. In early modern times the stocks and pillory were used. In the stocks the prisoner was held sitting down, with hands and feet fastened in a locked frame; in the pillory he stood, with hands and feet similarly secured in the frame. The pillory was abolished in England in 1837, but its use in the state of Delaware was allowed until 1905.

Flogging, probably one of the most widely employed forms of corporal punishment, has been utilized almost universally. At mid-twentieth century, it was still legal for certain criminals in Great Britain, Canada, some Continental and Asiatic countries, and in two states of the United States. Methods and instruments for flogging the lawbreaker have varied. Most widespread have been particularly cruel forms of the lash, including the "cat-o'-nine-tails," a whip of nine knotted rawhide thongs attached to a handle. A flogging with the Russian knout, made of dried and hardened rawhide thongs interspersed with hooked wires that tore the flesh, often resulted in death.

Whipping persists as a court-imposed method of corporal punishment in Maryland, where it is authorized for wife beaters, but seldom used, and in Delaware. In the latter state a given number of lashes may be administered at the discretion of the court for 25 different crimes. Administration of the lashing is in the hands of the warden in the state penitentiary near Wilmington. See CAPITAL PUNISHMENT; PUNISHMENT; WHIPPING; CRIMINOLOGY. B. H. M.

CORPORATE FINANCE. See FINANCE, BUSINESS.

CORPORATE STATE, or corporative state, is a government based on occupational groups (corporations, syndicates, or guilds), rather than on the traditional territorial representation by political parties. Derived from the medieval tradition of guild self-government, the theory of the corporative state was first developed by some socialist groups in Western Europe (and hence known as guild socialism or syndicalism). It attempted to remedy some alleged defects of the democratic parliamentary system and provide for fuller representation of the various social-economic interests in the government. Although experimented with in Weimar, Germany, and debated in France, England, and other countries, the corporative idea failed to gain a substantial following in Western democracies because of a deep class antagonism and the resistance of the established political institutions.

The theory of the corporative state was adopted in a modified form, however, by the dictatorial regimes in Italy and Germany and was used to justify the abolition of competing political parties and parliaments in those countries. The most complete corporative structure was set up in Fascist Italy, whose chamber of deputies, the *Camera Corporativa* was based on the *corporazione*, each corporation representing employers and employees in a particular industry, trade, or profession. The corporative chamber was superimposed by the Grand Fascist Council (*Gran Consiglio Fascista*) and the "leader" (*Duce*), the chief of both the government and the Fascist party, theoretically elected by the Grand Fascist Council. The real political power was vested, however, in the *Duce*, and the Fascist Council. A similar, though less complete, corporative structure was evolved in Nazi Germany where it served to subject the whole economic and social life to total control by the state.

After World War II the corporative system survived in Portugal and Spain. In 1933 the Portuguese chief of state, Salazar, introduced a new constitution making Portugal a "unitary and corporative republic." In 1937 Spain's Generalissimo Francisco Franco replaced the old trade unions by a state-controlled system of "vertical syndicates" and in 1942 reconstructed the Spanish *cortes* along corporative lines.

Although the corporative idea is far from being popular in the United States, some elements of functional representation may be found in the activities of economic pressure groups attempting to influence the policies of the government in their favor, as well as in the self-government of a number of craft unions and professions. The short-lived National Industrial Recovery Administration (1933–35) and the war-time industry advisory committees represented conscious attempts to institutionalize the relationships between special economic interests and the government.

CORPORATION. The corporation is "an artificial being, invisible, intangible, and existing only in contemplation of law." Any body of persons capable of acting as an entity and in a single name fixed by law and having succession is, in some sense, a corporation. For most purposes a corporation is an entity distinct from its individual members or stockholders who, as natural persons, are merged in the corporate identity, and remains unchanged and unaffected in its identity by changes in its individual memberships. By the very nature of a corporation, corporate property is vested in the corporation itself and not in the stockholders. Corporations may be classified generally as public or private, the distinction having reference to the powers of the particular corporation and to the purpose of its creation. Those corporations are public which are created for public purposes only, connected with the administration of the government, and the interests and franchises are the exclusive property and domain of the government itself. Private corporations are created for private as distinguished purely from public purposes. A large class of private corporations are quasi-public owing to the special franchises conferred on them, and for which they owe a duty to the public which they may be compelled to perform.

Creation and Dissolution. A corporation may be created and can exist only by virtue of authority from the government. It cannot be formed legally unless it is organized in compliance with the required statutory provisions. At one time it was rather difficult to obtain a corporate charter, since it was necessary to have a special act passed by the legislature to create a corporation. This method of creation by special act is now obsolete except in a few instances.

Today, generally, each state has what is often referred to as the Business Corporation Act. It is no longer necessary to petition the legislature in order to form a corporation. Three persons join as incorporators and state the purpose of incorporation, the proposed place of business, the names of the officers, and the amount of capitalization. After further selecting a name for the corporation, stating the number of years of proposed operation (it may be perpetual if desired), and submitting an application by mail to the secretary of state with the necessary fees, a certificate of incorporation will be issued by the state. The first meeting is the next step of importance. Corporate books are opened and bylaws for the internal regulation of the corporation are drawn up by the stockholders at this meeting. The board of directors and the officers start functioning and corporate life evolves.

If the life of the corporation is 99 years it automatically dies after that period expires. Likewise the law of the state that created the corporation may declare a forfeiture of the charter if the corporation has failed to comply with the material statutory regulations. The famous Dartmouth College Case gave the states the right either to amend or repeal a corporate charter in certain cases. (See DARTMOUTH COLLEGE CASE.) Furthermore, the corporation may decide to go out of business and dissolve before the time specified in its charter. In such cases it is only necessary that it make an application to the state that created it for a certificate of dissolution. The granting of such a certificate results in the death of the corporation. Even though the corporation does dissolve, the statutes of each state provide that for certain purposes the corporation will be considered alive, that is, being sued in tort, for breach of contract, or for payment of

obligations incurred. This period may be for two years, more or less, depending upon the law of the state involved. This rule of suspended animation is a statutory fiction made necessary by business logic.

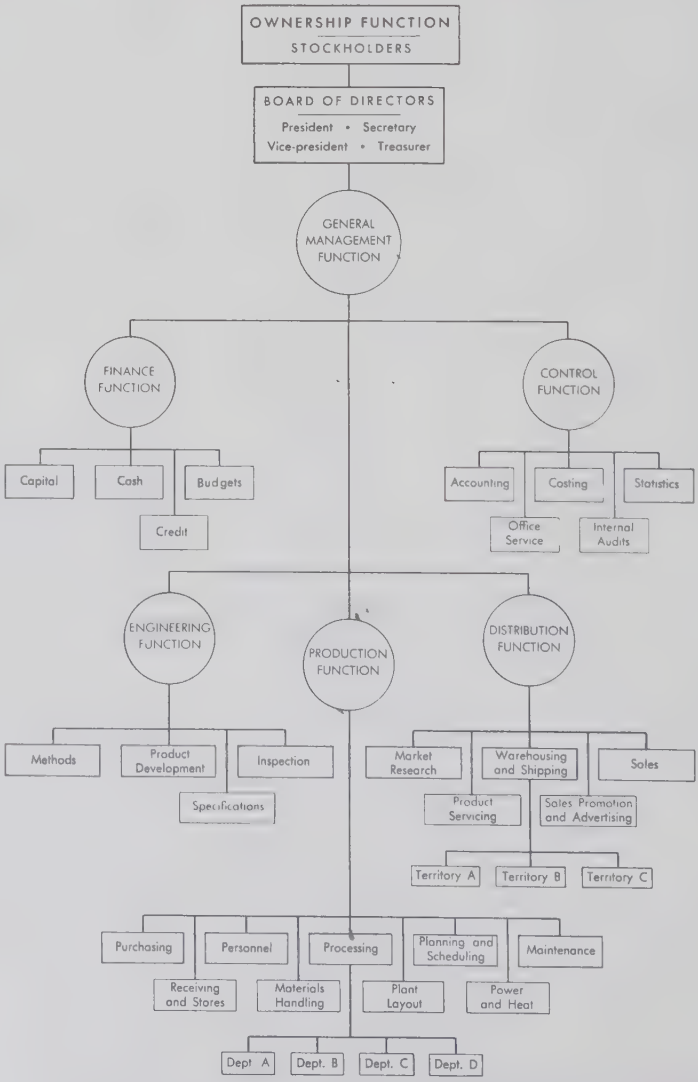
Upon dissolution of the corporation, its property and assets are distributed among the stockholders after the creditors are paid. At early common law, the personal property of a corporation escheated to the king and the corporation's real estate reverted to the original owners who had conveyed it to the corporation.

A *de jure* corporation is one which has been regularly created in compliance with all legal requirements and the right of which to exercise a corporate franchise is, therefore, invulnerable against attack except by the state in special (*quo warranto*) proceedings. If, through irregularity, defective organization or constitution, or failure to comply with the condition precedent, a corporation *de jure* is not created; if, at the same time, there has been a colorable compliance with the requirements of some law under which an association may be lawfully incorporated for the purposes and powers assumed and rights claimed to be conferred by the law were exercised, a *de facto* corporation is said to exist. It is essential to the existence of a *de facto* corporation that there be (1) a valid law under which a corporation with the powers assumed might be incorporated; (2) a *bona fide* attempt to organize a corporation under such law; (3) an actual exercise of corporate powers.

Corporate Powers. The distinguishing characteristics of a corporation are (1) a common seal symbolizing the unity of the corporation; (2) a distinct entity apart from that of the natural persons who constitute its stockholders; (3) transferability of ownership, as represented by shares of stock, without affecting the continuance of corporate existence; (4) perpetual succession, for although a corporation may be dissolved or pass out of existence with the expiration of its charter, it is endowed by law with perpetual life.

A corporation has only such powers as are expressly granted in its charter or in the statutes under which it is created, or such powers as are necessary for the purpose of carrying out its express powers and the objects of its incorporation. Generally, it may exercise the power to acquire or purchase personal chattels, take choses in action which are transferable by assignment, and may itself become the payee of commercial paper or bonds for indebtedness owing to it, unless in the pursuit of its authorized business there is no necessity for so doing. The statutory law generally allows a private corporation to purchase stock of another corporation, an action forbidden under common law. The same rules applied in cases of a corporation purchasing its own shares of stock.

A corporation has full power to alienate its property, both real and personal, unless it is restricted by *organic provision*, statute, *corporate* charter, or by considerations of public policy. The power to contract inheres in every corporation and is coextensive with its corporate powers. When such contract is not on its face necessarily beyond the scope of the power of the corporation by which it is made, it will, in the absence of proof to the contrary, be presumed to be valid. Unless there is some provision to the contrary in its charter or the general statutes, a corporation has the power to take and enforce a mortgage on real estate as security for indebtedness to it incurred in the ordinary course of its business. Unless the corporation is specially authorized to do so, the execution or endorsement of accommodation paper for the benefit of third persons is an act beyond the scope of its corporate authority (*ultra vires*). It is also *ultra vires* for a corporation to enter into contracts of guaranty or suretyship not in furtherance of its business, unless given express authority to do so. At common law it was the general rule that a corporation could not enter into a partnership agreement, but it still has been found expedient in a few jurisdictions to allow such a practice in certain cases as a matter of business logic. Sometimes, as a means of collecting a debt from a partnership, it has been necessary for the corporation to assume tem-



GEORGE S. MAY BUSINESS FOUNDATION

Typical Functional Relationships of Manufacturing Corporation

porary control of a partnership business. This is a recognized exception to the prevailing rule.

Officers and Directors. The board of directors of a corporation represents the corporate body and the officers are the executive representatives of the corporation. Since they are its agents, with authority to transact the ordinary business of the corporation unless specifically restricted in some respect, they naturally have very broad powers, and have a discretion to be exercised in good faith to control the infinite details of a business, including the wages to be paid, the number of working hours, the condition under which labor should be carried on, and the price for which the product shall be offered to the public.

The full extent of the authority of any particular officer of a corporation is to be determined by inquiry into the authority expressly conferred upon him or incidental to such express authority. In the case of third persons who had no notice of the officer's restricted authority, his authority is that which the corporation holds the officer out as possessing or is estopped to deny. Directors and officers in charge of the management of a corporation are under obligations of trust and confidence to the corporation and its stockholders, and must act with due care and diligence and within the scope of their authority. Directors are liable for any breach of their duty with respect to the capital and assets of the corporation. If they have not profited personally by their bad management or appropriated corporation property to their own use, courts of equity are inclined to be indulgent.

Duties and Liabilities. The liabilities of a corporation to its directors or officers are chiefly those which concern the payment of salaries or compensation for corporate services. A director or officer may become a creditor of a corporation, and as such is entitled to the same remedies as other creditors. He may lend money to the corporation, and enforce its repayment. He may also take security for his claim, such as a mortgage or lien on the corporate property, even though the debt held by such officer is in excess of the limit prescribed by the charter. In most instances directors and officers are not liable to corporate creditors or third persons for corporate acts or debts. They are merely the agents of the corporation, and as such are no more to be held liable than is any other agent for the acts and debts of his principal. They may be liable for mismanagement of the business of the corporation, or waste of its assets. They do not incur personal liability for its torts unless they have participated in the wrong. However, directors generally are held responsible for their business acts, whether of commission or omission, despite their ignorance, inexperience, or good faith. In the absence of specific provision the directors are not entitled to a salary, but if a director is a lawyer and does legal work for the corporation he is entitled to compensation. A director or officer of a corporation is not, according to the prevailing rule, liable for an offense committed by the corporation except where he has in some way participated with the corporation in the illegal act, even though the corporation's offense consists of the violation of a statute which imposes imprisonment as a penalty. Where the crime charged involves guilty knowledge or criminal intent, it is essential that the officer of the corporation, to be criminally liable, actually and personally do the act which constitutes the offense or that it be done by his direction or permission. Under the common law a corporation, being an artificial creation, was incapable of committing a tort. Today it is the general rule that a corporation is liable for the torts and wrongful acts of its officers, agents, or employees acting within the scope of their authority or the course of their employment.

Originally a private corporation was held incapable of committing a crime; today the law is otherwise. This has been the result of a gradual change in view. It was first decided that a corporation could be held liable for a misdemeanor, such as a failure to prevent a nuisance. The next change was effected when it was held that a corporation could be made criminally liable for a felony, although there was a school of thought that reluctantly conceded the extension of the law that far. How could a corporation have a criminal intent? What about the crimes that entail punishment in the penitentiary? It was admitted that there were exceptions to the new doctrine but in general a corporation is responsible for violations of the criminal code the same as is a human being. Although a corporation is not liable for murder or rape, it has been held liable for manslaughter and other felonies such as obtaining money by false pretenses. A fine in the nature of a money assessment against the corporation is the usual punishment under the criminal code where a corporation is the defendant. As the corporation acts by means of its agents, it is customary also to charge some of the officers and at times the directors, since an agent is personally liable for his criminal acts. There is always this double aspect of criminal liability in cases involving corporations.

Stockholders. The relation of stockholders to the corporation whose stock they hold is that of contract, and all the rights and duties of all parties grow out of the contract implied in the subscription for stock. This relation is within the protection of the U.S. Constitution, which prohibits legislation impairing the obligation of contract. The prevailing view is that a corporation is charged with the duty of trustee toward its stockholders for many purposes. The provisions of the charter and bylaws of a corporation are to be considered—not alone the recitals in certificates of stock issued by it—in the determination of the rights of the stockholders. There was a sharp line drawn between the directors and stockholders at early common law. Extraordinary corporate matters had to be approved by the stockholders in meeting assembled. The directors handled ordinary business without interference of the stockholders. Today the directors are often given specific authority to handle certain extraordinary matters without the approval of the stockholders; at common law the stockholders' assent would have been required.

Among the rights enjoyed by the stockholders are (1) the right to inspect books and records from which they can derive any information which will enable them better to protect their interests and to perform their duties as stockholders. As an incident of this right, a stockholder may make copies or extracts therefrom; (2) to bring a representative suit on behalf of the corporation after exhausting the remedies within the corporation unless there was no opportunity for redress or it would be unavailing; (3) to control corporate policies through stockholders' meetings by vote of the majority of the stockholders; (4) the right of voting stock and electing directors at corporate meetings, unless they are nonvoting holders.

In the absence of a charter or constitutional or statutory provisions to the contrary, stockholders are not individually liable today for the debts or obligations of the corporation. They are, however, liable to creditors of the corporation to the extent of what remains unpaid on their several shares, according to their subscription contracts; a stockholder at early common law could be held liable for the debts of the corporation. The rule today that generally limits the liability of a stockholder to the amount paid for the shares he has purchased is of statutory origin. Some state statutes have provided for double liability. An example of such a rule is the Illinois statutory provision that made stockholders in banks subject to a double liability; if a shareholder sold his bank stock before the bank failed he was not relieved of double liability and, strange to say, the same disability was cast upon the person to whom the stock had been sold. There is another exception in some states to the rule that the stockholder is not liable for the debts of the corporation. By statute it is sometimes provided that

employees who cannot collect their wages from the corporation may sue the stockholders.

Stock Voting. In early law the New England town meeting system of allowing each stockholder one vote, no matter how many shares of stock the shareholder owned, was the usual system of voting. Today a stockholder is generally allowed as many votes as he has shares of stock. By statute certain stockholders may be classified as nonvoting. Likewise in some states the anomaly of cumulative voting prevails whereby the stockholder can, for example, give three votes to one director, if there are three directors who are candidates and each is entitled to a vote. Cumulative voting often enables a minority group of shareholders to elect one of their choice; without such a method they would have little chance of electing a representative who was not supported by the majority. The owner of shares of stock may vote by proxy, that is, by appointing another person to cast his vote. Likewise the stockholder can enter into reasonable voting agreements with other stockholders and thereby pool their votes for the purpose of having voting strength. They may also enter into a voting trust agreement whereby they transfer their shares of stock to trustees for voting purposes, and in turn receive from the trustees certificates of trust in lieu of their stock. The voting trust is a modern development that has been reluctantly recognized in some jurisdictions. Where it is allowed it must be created for only a reasonable period of time, which is usually specified in the Business Corporation Act of the state.

A payment to the stockholders as a return upon their investment is, in general, termed a dividend. A dividend requires the concurrence of two things (1) surplus earnings, (2) a corporate resolution by the directors declaring the corporate policy of paying a portion or all of such surplus to the stockholders. In the absence of special contract or statute it rests in the sound discretion of the board of directors to determine the circumstances under which dividends will or may be declared out of earnings or profits. Even though money is available for that purpose, if the board of directors deems it inexpedient to declare a dividend at any time, the minority stockholders cannot compel the directors to do so. Nevertheless, if the refusal is either arbitrary or fraudulent, the minority can seek relief in the courts and extant cases indicate that the courts will order the declaration of a dividend; such cases are the exception, however, rather than the rule.

Foreign Corporations. A foreign corporation is one doing business in a foreign jurisdiction, for example, an Illinois corporation operating either in Indiana or any other state or country. If the state of Illinois creates a corporation, the corporation doing business in Illinois is referred to as a domestic corporation and Illinois is referred to as the home state.

Foreign corporations often run afoul the law unless they qualify as a foreign corporation to engage in business in a foreign jurisdiction. Much of this difficulty is caused by failing to consider whether the business that the corporation pursues is *interstate* business or *intrastate* business. At the outset, in any consideration of this matter it is wise to determine the significance of the legal meaning of *interstate* and *intrastate* business. Suppose that an Illinois corporation is desirous of engaging in business in Gary, Ind. If it is engaged in a business transaction that is partly in Indiana and partly in Illinois (or any other jurisdiction), the corporation would be classed as a foreign corporation doing *interstate* business. If such is the case the federal government by virtue of the commerce clause of the federal Constitution has jurisdiction to regulate and control such operations as a matter of *interstate* commerce. In such a case the state of Indiana has no jurisdiction. On the other hand, if the business that the Illinois corporation will engage in at Gary, Ind., is local (*intrastate*), the state of Indiana controls and regulates the admission or rejection of the Illinois corporation as to the matter of engaging in *intrastate* or local business in Indiana.

Before entering a foreign state the corporation should introduce itself by presenting its credentials from its home state and qualify for registration as a foreign corporation by complying with the essential financial and registrational formalities. If the corporation fails to do this and engages in business in the foreign state, it does so as an outlaw. Thus if it sued for work done an objection that it was a foreign corporation engaged in *intrastate* business without qualifying as a foreign corporation would be upheld. Likewise, most state statutes penalize a foreign corporation that fails to qualify as a foreign corporation for every transaction it concludes as an outlaw. Furthermore, the stockholders and officers of the foreign corporation operating under such a disability may find that the law of the foreign state considers the business organization as a partnership and makes them individually liable as partners. It is to be noted that difficult legal questions arise when an attempt is made to classify either an act or transaction as being *interstate* or *intrastate* in foreign corporation matters. In many instances the question is an open one that requires professional interpretation or judicial decision.

Governmental Corporations. The federal government until comparatively recently made very little use of the corporation as an agency for executing the laws of Congress. Early in the course of the nation's development the government chartered banks and shared in their ownership, utilizing them in the fiscal operations of the treasury. Beginning with World War I the corporate form of administrative agency was utilized to avoid difficulties which would arise if the execution of the wartime activities were attempted by one of the political departments of the government.

Most of these government corporations began liquidating as soon as their war functions had been completed, and only two new corporate types were authorized by Congress before the depression began in 1929 to press upon and compel action by the federal government. Starting with the Hoover administration and reaching a fast pace early in the administration of F. D. Roosevelt there was a mushroom growth of governmental corporations designed for administrative, fiscal, relief, and reconstructive purposes. Many of these were specifically created by statutes of Congress; others were created by executive order of the president when it seemed appropriate to utilize such an agency to attain a purpose authorized by law.

To further the war effort during World War II, the corporate device was extensively employed, and governmental corporations were engaged in the production, acquisition, selling, and other dealing in materials; in the purchase, sale, leasing, and building of manufacturing plant property; and in the operation of transport facilities, to name some of the more important aspects of these activities. Among such companies, which were dissolved shortly after the war, were the Defense Plant Corporation, Metals Reserve Company, Rubber Reserve Company, Defense Supplies Corporation, and United States Shipping Board Merchant Fleet Corporation.

Most of the corporations that were created before World War II for relief purposes were dissolved by 1946, such as the Public Works Emergency Housing Corporation, Federal Surplus Relief Corporation and Federal Subsistence Homesteads Corporation. However, those which were organized to stabilize credit and financing were continued in existence (either on an active basis or to liquidate their holdings), such as the Reconstruction Finance Corporation, Commodity Credit Corporation, Federal Farm Mortgage Corporation, Home Owners' Loan Corporation, Production Credit Corporation, and Regional Agricultural Credit Corporation. In the field of banking, two major corporations function as stabilizing insurance factors, the Federal Deposit Insurance Corporation and the Federal Savings and Loan Association Corporation.

Another type of government corporation is that which operates as a public utility, such as the Tennessee Valley Authority (see TENNESSEE VALLEY AUTHORITY) and Inland Waterways Corporation. The latter was organized in 1924 and operates barge lines and a rail line. It functions on funds derived solely from its operations.

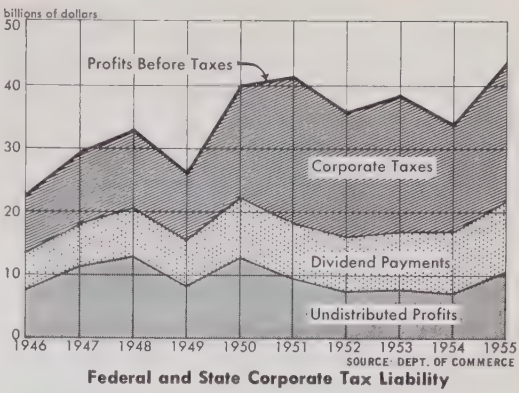
The federal corporation is wholly owned by the government and its stock is purchased by the secretary of the treasury on behalf of the government or by another governmental corporation. It functions in a similar fashion to a private corporation, but the ultimate management is usually vested in a board of directors appointed by the president with the advice and consent of the Senate, or in a state department with the head of the department exercising all the right of ownership of the stock, or in another government corporation of which it is a subsidiary. The Reconstruction Finance Corporation has had a number of subsidiary companies. See GOVERNMENT OWNERSHIP; RECONSTRUCTION FINANCE CORPORATION.

CORPORATION TAX, any form of taxation levied on corporations only, as distinguished from individuals and partnerships. By far the most important tax on corporations in the United States is the federal tax on corporation income, which dates from the adoption of the sixteenth amendment in 1913, legalizing the imposition of direct taxes on income. Corporations are also subject to a number of minor federal and state taxes, including incorporation, franchise, and income taxes. See TAXATION.

Taxation, 1913-1940. In 1913 the tax rate on corporate net income was only 1 per cent. During World War I the rate was raised to 12 per cent while excess profits were taxed at rates ranging up to 65 per cent. The excess profits tax was repealed in 1921, and during the 1920s the corporate income tax ranged between 10 and 13½ per cent. The need for increased revenue during the depression of the 1930s led to a further rise in rates. In 1936 the exemption of dividends from the personal normal tax was discontinued and, at the urging of Pres. Franklin D. Roosevelt, Congress enacted a tax on undistributed corporate profits, with rates ranging from 7 to 27 per cent. In advocating this measure, the president maintained that corporations were retaining a substantial part of their profits in order to enable large stockholders to avoid paying high taxes on dividends. Because the reinvestment of retained earnings was a major source of capital for business enterprises the measure proved unpopular. Small corporations which could not raise capital by selling their securities in the open market were believed to be particularly hampered. In 1938 Congress sharply reduced the rates, and in 1939 repealed the tax. This caused greater emphasis to be placed on another section of the act, which imposed a punitive tax on corporations that retained earnings to an "unreasonable extent" to avoid the tax on dividends.

Taxation after 1940. With the advent of World War II, the vast requirements of war finance led to a steep rise in corporate income tax rates. From a maximum of 19 per cent in 1940, they were raised to 40 per cent in the Revenue Act of 1942. In addition, an excess profits tax was enacted which permitted income and excess profits to be taxed to a maximum of 80 per cent. The excess profits tax was repealed as of Jan. 1, 1946, and the income tax was cut to 38 per cent.

The expanded rearmament program that followed the outbreak of the Korean War in 1950 again caused a sharp increase in rates to a total of 52 per cent, including the normal tax of 30 per cent on all taxable income and a surtax of 22 per cent on net income over $25,000. In addition, excess profits were taxed up to Dec. 31, 1953, so that the maximum total tax could go up to 70 per cent. The total yield of federal income and excess profits taxes from corporations increased from $10,854 million in the fiscal year 1950



Federal and State Corporate Tax Liability

to an average of $21,528 million in the years 1952–1954. In the fiscal year 1955 corporation taxes made up 30 per cent of total federal budget receipts. About two-thirds of the states also taxed corporations on their net income. Revenues from state corporate income taxes amounted to approximately $900 million in 1955. A portion of these revenues went to local governments.

Economic Effects. It is difficult to determine who ultimately bears the burden of the corporation profits tax. In so far as a business enterprise is able to pass on the tax in the form of higher prices, the cost is shifted to consumers. In this event the tax has been criticized as a concealed and unfair indirect levy on consumers. Where conditions in a given market make it impossible to shift the burden, the tax is borne by stockholders, whose dividends are thus subjected to a double taxation. High tax rates have been criticized on the ground that they retard economic growth by taking away from industry funds which might otherwise be reinvested, and because they deter businessmen from entering new fields. They also encourage raising of new capital by borrowing rather than by sale of stock, since interest may be deducted from income as a cost of doing business. Many other major business decisions are influenced by the possible tax impact. See FINANCE, BUSINESS.

Tax Code Revisions. The Internal Revenue Code enacted in 1954 thoroughly revised the federal tax system for the first time since the income tax was originally introduced. A start was made to give relief from double taxation by providing an exemption of up to $100 and an additional tax credit of 4 per cent on dividends received after July 31, 1954. Allowances for depreciation were increased so that up to two-thirds of the cost of new plants and equipment could be charged off in the first half of their useful life. Corporations were also permitted to apply losses against profits in previous years over a two-year period. A step was taken to put the corporation tax on a pay-as-you-go basis by requiring corporations to pay a progressively increasing proportion of the tax during the taxable year, with a maximum of 50 per cent scheduled for 1959.

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CORPS, ARMY. See ARMY CORPS.

CORPSE, a dead human body. As a person is separated by death from the body, the law regards a

corpse as incapable of holding property or being the subject of property. Unlike stealing of a corpse, any removal of the coffin or gravecloths, which constitute the property of those who buried the corpse, is larceny. Prevention of burial, indecent exposure, mutilation, or an unauthorized exhumation of a dead body are subject to criminal punishment. The burial of a dead body, unless otherwise provided in the will, devolves upon the surviving spouse, the next of kin or, in the absence of these, upon a person in whose house death occurred; otherwise the duty of burial devolves upon the local government. See Burial; Cremation; Death; Embalming; Postmortem.

CORPS OF ENGINEERS. See Engineers, Corps of; Army of the United States.

CORPUS CHRISTI, city and port of entry, S Texas, county seat of Nueces County, on Corpus Christi Bay, an inlet of the Gulf of Mexico, at the mouth of the Nueces River; on the Missouri Pacific, the Southern Pacific, and the Texas Mexican railroads and U.S. highways 77 and 181; a scheduled airline stop; 133 miles SSE of San Antonio. Corpus Christi is situated in a cotton and livestock area and in an oil and natural gas producing district. Industries include oil and zinc refineries, foundries, alkali, chemical, and cement plants, sorghum processing plants, cotton gins, and cottonseed oil mills. A major ocean port on the Gulf of Mexico, Corpus Christi ships cotton, fish, fruit, petroleum, sulfur, chemicals, and zinc. It is the site of a U.S. Naval Air Station, Del Mar College, and the University of Corpus Christi. Corpus Christi Bay was discovered by the Spanish in 1519 and was a pirate stronghold in the early nineteenth century. Settled in 1838 as a trading post by Henry L. Kinney, Corpus Christi was claimed by both Mexico and Texas and was occupied by Zachary Taylor and U.S. forces during the Mexican War (1846–48). It was captured by the Union army in 1862 during the Civil War. Corpus Christi's population more than doubled after 1940. Pop. (1950) 108,287.

CORPUS CHRISTI, Latin, "body of Christ," a great festival of the Roman Catholic church, was instituted in 1264 by Pope Urban IV to commemorate the Holy Eucharist. The date is the Thursday after Trinity Sunday (eighth Sunday after Easter). The feast was formerly celebrated on the Thursday before Easter; the change was made because Holy Week is preoccupied with other observance. In Roman Catholic countries the festival is marked by magnificent processions. In the United States and some other countries most of the celebration is on the Sunday after Trinity Sunday.

CORPUS CHRISTI BAY, arm of the Gulf of Mexico forming the harbor and port of Corpus Christi, S Texas, bounded by the city of Corpus Christi and Nueces Bay on the W, on the E separated from the Gulf by Mustang Island. The bay is about 25 miles long and 3 to 10 miles wide.

Corpus Christi, Tex., founded as a trading post in 1840, is today one of the chief ports on the Gulf of Mexico, and an important manufacturing and oil refining center.

CORPUS CHRISTI C. OF C.

CORPUS CHRISTI COLLEGE. See Cambridge University; Oxford University.

CORPUS DELICTI, in law, the essence or the body of offense charged, which must be established before the accused can be convicted. Thus in case of homicide, a *corpus delicti* would consist of two basic facts to be proved: the death (the body must be found and identified); and the existence of criminal agency as its cause. In prosecutions for crimes a confession alone is not regarded as a sufficient proof.

CORPUS JURIS CANONICI. See Canon Law.

CORPUS JURIS CIVILIS, the body of the Roman civil law, restored in the late Middle Ages and still constituting the basis of the civil law in continental Europe and Latin America. The title has been applied since the seventeenth century to a collection of laws codified in the sixth century under the auspices of Emperor Justinian, and comprising the *institutes*, the *pandects* or *digest*, the *code*, and the *novellae*.

CORRAL or **PUERTO DE CORRAL,** town, S central Chile, in the province of Valdivia, on the Pacific Ocean, at the mouth of the Valdivia River, 13 miles SW of Valdivia. Corral, the seaport of Valdivia and a popular vacation resort, is also a minor industrial center mainly important for iron and steel manufacture. During the struggle for Chilean independence Lord Cochrane's naval forces secured an important victory over the Spanish royalists at Corral (1818). Pop. (1952) 9853.

CORRECTIONAL EDUCATION, an educational program in correctional institutions, consisting of classroom, trade, and vocational instruction. The program is an essential part of the rehabilitation of criminals, 95 per cent of whom ultimately return to society. Between 10 and 30 per cent of the persons confined in penal institutions have less than a fifth grade education, and about 60 per cent are unskilled or semiskilled.

Education contributes to the rehabilitation of prisoners by helping them to develop new attitudes and abilities. It can provide skills for earning an honest living, a strengthening of self respect, and a capacity for getting along with others. The educational program can also lessen prison disciplinary problems, teach constructive work habits, build inmate morale, and train prisoners for institutional work, thus increasing their productivity during incarceration.

Background. The first prison teachers in the United States were clergymen, who gave inmates religious tracts, Bibles, and instruction and sought to convert them. In 1841 regular classes were started in the Boston, Mass., house of correction, and in 1847 the New York legislature provided for appointment of two teachers for each of the state's prisons, thus introducing academic education into major penal institutions. In 1876 prison education received its greatest impetus with the beginnings of the reformatory movement in the new institution at Elmira, N.Y., which stressed educational and vocational training. See Prison.

Federal Institutions. Educational programs are well developed in institutions under the jurisdiction of the United States Federal Bureau of Prisons, established in its present form in 1930. General programs aim to raise the literacy level of prisoners and to give instruction to those who wish to complete grade or high school or make up basic school deficiencies. Emphasis is on reading, writing, and arithmetic. At the intermediate level most of the courses are related to the individual's vocational training or lead to eighth grade diplomas. High school courses are offered and diplomas are awarded through the public school system where the prison is located or through state departments of education. Federal institutions also offer a wide variety of instruction for prisoners interested in special subjects rather than credit classes.

ILLINOIS STATE PENITENTIARY

High school graduation exercises are held regularly at Stateville prison, Illinois, where training in 42 trades, as well as academic courses, is available to all inmates.

These range from public speaking to typing, history, and creative writing.

Vocational education in the federal system is designed to increase the potential employability of the prisoner and, if possible, to fit him for a specific kind of work on release. Training is available in such occupations as machine shop, plumbing, sheet metalwork, and in the design and manufacture of prosthetic appliances. Graduates of the airplane mechanics school at the federal reformatory, Chillicothe, Ohio, qualify for engine and aircraft mechanic licenses issued by the Civil Aeronautics Administration. In 1954 vocational training in 14 federal institutions had been accredited by state boards. See FEDERAL BUREAU OF PRISONS.

State Prisons. State institution educational aims are essentially the same as federal objectives. Notable among prison programs in the mid-1950s was that of California, where teachers in the prisons were part of the public school system. At San Quentin, for example, an educational director and staff of nearly 100 inmates gave instruction in classroom subjects ranging from business, applied sciences, and languages, to art and music; also available were 175 University of California extension division correspondence courses.

Inmates of Stateville and Joliet prisons in Illinois were offered an educational program under a staff supervised by a professional educator. Except in isolated cases, all prisoners were required to complete eighth grade, and encouraged to continue through high school. Successful completion of studies entitled the inmate to the equivalent of a high school diploma, which made no reference to place of study. The institutions' vocational departments offered training in 42 trades, including barbering, tailoring, furniture manufacturing, canning, dairying, and bookbinding.

Prisoners in the Clinton, N.Y., state prison and other New York correctional institutions were offered class instruction in subjects such as shorthand, advertising, social science, marketing, salesmanship, arithmetic, grammar, and mechanical drawing. Trade training included carpentry, machine shop practice, barbering, agriculture, and electricity. For inmates of Indiana State Prison in Michigan City, 114 courses were offered at educational levels from the elementary grades through high school. High school work was furnished through Indiana University. Cooking, bricklaying, nurses' training, stationary engineering, ironsmithing, and shoe repair work were trade courses offered.

The educational program in many prisons, particularly in state institutions, was handicapped by inadequate personnel, funds, facilities, and supplies; however, many advances were made after 1930, inspired to a great extent by the federal bureau and the Correctional Education Association, an affiliate of the American Correctional Association, which furnished leadership in the improvement of educational procedures and techniques. See CORRECTIONAL INSTITUTION; CRIME; CRIMINOLOGY. B. H. M.

CORRECTIONAL INSTITUTION, a place of detention for juvenile delinquents which aims primarily to train and rehabilitate, rather than to punish, youths committed to its custody. Another important function of the institution is a protective one—that of holding youngsters who may be dangerous to themselves and to the community for treatment until they can readjust to society and be returned to their homes. Correctional institutions often are known as training schools or industrial schools, or by their antiquated name of reform schools. Similar institutions for adults are sometimes called houses of correction or reformatories and occasionally correctional institutions. See PRISON.

The first special institution for the treatment of juvenile delinquents in the United States was established in New York City in 1825 by the New York Association for the Prevention of Pauperism, and the state made annual appropriations for its maintenance. A similar institution was opened in Philadelphia in 1826, and a state-controlled one was opened in Massachusetts in 1847. The idea spread and many states established similar institutions during the latter half of the century. In 1953 there were 129 state correctional institutions in the United States, its territories and possessions. In addition there were numerous privately operated training schools throughout the country.

Some of the earlier institutions were known as houses of refuge. They were established for the purpose of caring for juvenile offenders apart from adults in the hope that the error of their ways could be corrected early. Because of the scarcity of facilities for the care of children, these early institutions tended to become overburdened with homeless, rather than delinquent children. The progressive development of general child welfare programs, particularly after 1930, did much to solve this problem by providing for the child who was dependent but not delinquent. See CHILD WELFARE.

In the early institutions there was much emphasis upon religious influence and rigid routine. Methods of approach varied with the philosophy of the superintendent and the theories of the times. In some cases it was hard work which was supposed to bring about rehabilitation; in others it was military training or strict discipline. The early institutions provided almost no academic education and little real vocational training.

Modern training school programs contrast sharply with those of this early period, although vestiges of the ancient approaches are often still apparent in some of the most modern institutions. Leadership in the better correctional institutions is provided by persons trained to understand people and to guide human conduct.

The Clinic Approach. The heart of the modern correctional institution is the clinic team made up of the psychiatrist, the psychologist, and the caseworker, supplemented by various other persons who come in contact with the juvenile. It is the responsibility of this team to study each boy or girl upon admittance, to formulate a treatment plan, and to see that this plan is carried out. At frequent intervals the clinic reviews the progress of each youth, making whatever program adjustments are necessary. It is usually the clinic team that decides when a child has reached the point of readiness to return to the community.

Many different methods of approach are at the disposal of the clinic team in the modern training school. Case workers gather information on the young person's background and work with his family and with the youth himself throughout his stay. The psychologist and psychiatrist are frequently available to do individual work. Educators also play an im-

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Parents Day at the Pennsylvania Industrial School in Huntingdon gives the youthful inmates an opportunity to display and sell the numerous objects they have made.

portant role. Children who are committed often are found to be retarded educationally and to present many special problems in instruction. Teachers trained in special education methods are a necessity; vocational training is also emphasized by many such schools, particularly for older children. See Vocational Education.

Housing and Recreation. In most correctional institutions the youngsters live in cottages housing from 12 to 50 individuals. The common pattern in boys' schools is to have a man and his wife in charge of each cottage, with assistants if necessary. Girls' schools more frequently use a matron system. The influence of the cottage parents or matrons is regarded as important in the treatment of each child.

Recreational activities play an important role in the modern correctional institution. Experts feel that the youth's learning to participate in wholesome recreation with his fellows is part of learning to live and is particularly important for delinquents, many of whom have been deprived of this experience. Good recreational leadership is also important in making life endurable in the institution and in keeping up morale. Most schools have chaplains on either a full or part time basis to provide religious counseling and to plan and carry out other religious activities.

Aftercare. More and more emphasis has been placed upon working with the boy or girl to assist in his adjustment after he returns to the community. Approximately one-third of the state training schools provide this service as a part of the school program. In other states it is provided by the state agency supervising the correctional institution or by some other state or local agency. Such follow-up service is almost universally regarded as basic to the work of the correctional institution.

Forestry Camps. A variation of the training school approach is the forestry camp for delinquent boys. Camps established in Minnesota, Wisconsin, California, and Maryland offer an excellent opportunity for treatment in an informal setting. A correctional program can be planned which is varied and interesting, and which presents maximum opportunity for individual attention to boys with problems. In addition, the work done by the boys in public forests can make an important contribution to state conservation programs.

Administration. State correctional institutions usually are administered by a superintendent under the direction or supervision of a central state agency such as a state department of public welfare, department of correction, or a youth authority. This tie-in with an over-all state agency works most successfully when the agency has broad responsibility for the well-being of children. The correctional institution represents only a phase in a total treatment plan and effective institutions work in close co-operation with the courts which commit children to them and with welfare departments and other allied agencies. Some correctional institutions have citizen boards with advisory, policy-making, or administrative powers.

A study by the Census Bureau showed that in 1950 out of 29,820 persons in public correctional institutions for juvenile delinquents in the United States, 21,450 were in the 14-to-17-year age group and 4500 were 7 to 13 years old. The remainder included a scattering of younger children and 3720 young people 18 and over.

Per capita costs for training schools vary considerably. The Children's Bureau of the Department of Health, Education, and Welfare reported that in 104 state training schools in 1953 the average per capita cost per day was $5.47, with costs ranging from an average of $2.87 for the southern states to $7.25 for the northeastern states. Length of stay also varied greatly from school to school and for individual children, with the median length of stay 11½ months. See Juvenile Delinquency.

Maurice O. Hunt

CORREGGIO, real name Antonio Allegri, 1494–1534, Italian painter noted as a precursor of the baroque style, was born in Correggio. The chronicler Giorgio Vasari described him as sunken in poverty from birth, but this contemporary account is belied by the excellent education which the artist received. Correggio's uncle, Lorenzo Allegri, a local painter, was apparently his first art teacher. The critic Bernard Berenson maintains that Correggio was a disciple of Lorenzo Costa, and that he was influenced by Andrea Mantegna, Lorenzo Lotto, and Dosso Dossi. At 20 Correggio signed a contract to paint an altarpiece for the local Franciscans; this work, the *St. Francis Madonna*, uneven in quality, is the first painting definitely attributable to him. In 1519 he married the 15-year-old daughter of the Duke of Mantua's shield-bearer; the girl served as model for many of his madonnas, notably the *Madonna Zingara* (at Naples). In 1520 he established himself at Parma, where he painted the dome and tribune of the church of St. John, and later did frescoes in the cathedral. In 1522 he was commissioned to do the *Virgin Adoring the Child* (now in the Uffizi, Florence), and his two masterpieces, *Night* (at Dresden) and *Day* (at Parma). In his work on the frescoes in Parma he had the help of several outstanding artists, including the very young Parmigianino; nevertheless the work in no way satis-

One of Correggio's most famous mythological masterpieces is *Leda and the Swan*, in the Berlin Museum. He has often been called the greatest painter of feminine beauty.

BERLIN MUSEUM

LOUVRE, PARIS

In Correggio's *Mystic Marriage of St. Catherine*, which hangs in the Louvre in Paris with many of his drawings, are combined most of the artist's best-known techniques.

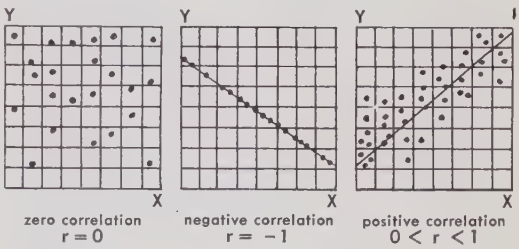
fied the authorities, who threatened to whitewash the walls which, according to one of the charges, resembled a "platter of still-live frogs." Fortunately for the painters, the all-powerful Titian visited the city. His unchallengeable and positive endorsement of the frescoes saved them, and Correggio was promptly paid the arrears for his work. This difficulty surmounted, Correggio lost his young wife, who died in 1528; he returned to his native city in 1530, withdrawing to a house he owned there.

In 1530–32 he painted the *St. George Madonna* for the church of St. Peter Martyr at Modena. In the years immediately following his return to Correggio he painted the famous works *Danaë* (Borghese Gallery, Rome), *Io and Jupiter* (Vienna), and *Leda and the Swan* (Berlin)—all erotic scenes from mythology. In 1534 he was commissioned to paint an altarpiece at the church of St. Augustine, but early in the same year he died, at the age of 40, and the work was left unfinished.

Although his work lacked the intelligence which distinguished the art of his Renaissance contemporaries, Correggio was a master draftsman and colorist. Outstanding in his paintings were the amorous faces of his women, soft and sensuous. His work exuded love, delight, ease, and satisfaction with life. His landscapes were opulent, his figures rich. He was, perhaps, the great painter of feminine beauty. Moreover, some of his paintings were models in chiaroscuro. His drawings showed a potent psychological skill, and were more incisive and strong than his paintings. The *Mystic Marriage of St. Catherine* (in the Louvre, Paris, where many of his drawings are also to be found) demonstrated all his virtues. His *Noli Me Tangere* (Prado, Madrid) was one of the tenderest of all paintings and its dynamic fluidity pointed the way to the baroque. ANTHONY KERRIGAN

CORREGIDOR, fortified island, N central Philippine Islands, off W Luzon, in the province of Cavite, commanding the entrance to Manila Bay. The island, sometimes known as the "Rock," rises abruptly from the sea and is approximately 2 square miles in area. Corregidor was well fortified by the Spaniards in the eighteenth century, and after 1898, when the United States acquired the Philippine Islands, the island's defenses were modernized. Under U.S. control Corregidor became one of the most strongly fortified places in the world. During World War II, after the fall of Bataan in 1942, the U.S. forces under General Jonathan Wainwright made a last stand on Corregidor against the Japanese. Although subjected to five months of air and naval bombardment and 28 days of siege, the U.S. forces resisted until May 6, 1942, before surrendering. More than 11,000 Americans and 30,000 Filipinos were taken prisoner by the Japanese after the surrender. Corregidor was reconquered by U.S. forces on March 2, 1945. Under the Republic of the Philippines, established in 1946, Corregidor and the nearby Bataan Peninsula became a national shrine. See BATAAN.

CORRELATION, a mathematical concept used in studying the relation between two sets of numerical data or of elements such as points and lines. It is particularly useful in statistical studies. For example, suppose the weight and height of each member of a group of boys are known. Thus a boy whose height is 60 inches and weight is 92 pounds provides one pair of numbers (60, 92) that are associated with that boy. Suppose pairs are formed for all boys in the group, care being taken to make height always the first member of the pair (height, weight). Then the two sets of the data are said to be correlated. If the group is an unselected sample of boys, there will be a tendency for the larger weights to be paired with the heights of taller boys. The relationship in general will not be such that it is possible to predict precisely the weight of a boy if only his height is known (see FUNCTION); nevertheless, for problems of this type correlation theory provides methods of estimating values of one variable which correspond to known values of the other variables.

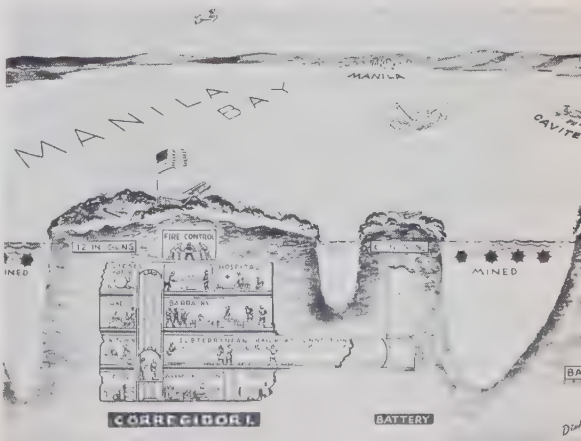


Correlation

Correlated sets of numerical data may be represented graphically by using a Cartesian co-ordinate system (see COORDINATE). When each pair of numbers is plotted as one point the result is a scatter diagram. Usually the points will not appear to be on a straight line or any familiar curve, but sometimes they do fall in a band or strip that seems to be nearly straight. (See figure.) When it may be assumed that the relationship between the variables is approximately linear, a number r called a coefficient of linear correlation, may be computed. This number plays an important role in correlation theory.

Despite its firepower, Corregidor fell to the Japanese in May 1942 after five months bombardment. U.S. troops under General MacArthur retook the island early in 1945.

INTERNATIONAL NEWS PHOTOS



If, as the values of one variable increase, those of the other also tend to increase, the correlation coefficient is positive. One example is the relation between weight and height for boys. If, as the values of one variable increase, those of the other tend to decrease, the correlation coefficient is negative. One example is the usual relationship between the temperature of the air and the altitude. If there is an exact linear relationship between the variables, then $r = +1$, or $r = -1$. Values of r near zero are associated with an extreme scattering of points in the scatter diagram, and in such cases little if any additional information about the relationship is obtainable by linear correlation methods. Methods exist by which the investigator can estimate the probability that a calculated coefficient is really different from zero, or that a value of r found from one set of data is "significantly different" from the value found from another set, when both sets presumably represent the same relationship between the variables.

When the value of the correlation coefficient is sufficiently large (for example, .90 or larger), it may be used to determine a regression line for one variable to the other, and there are corresponding formulas for estimating values of one variable which correspond to those of the other. Formulas involving r are also used to estimate the deviations of the observed values of a variable from the corresponding estimated values of the variable.

Linear correlation theory is extensively used in research in many different fields of study. Moreover, methods exist for the study of curvilinear correlation, but they are less frequently used. Multiple correlation coefficients are used to study the relationship between a dependent variable and two or more independent variables. Partial correlation coefficients are used to study the relationship of one variable to another when a constant value is assigned to each of the other variables that may be included in the study. When a correlation coefficient significantly different from zero is obtained from a set of data, it does not necessarily follow that a casual relationship exists between the variables. Questions of this sort fall outside the domain of correlation theory. M. L. Hartung

CORRESPONDENCE COURSE, a program of education or training conducted by mail. It is usually a course of self-study according to a prearranged plan, with varying amounts of help from a tutor to whom written lessons are submitted. The student is supplied with lesson materials, which may include a study guide or syllabus, texts, laboratory equipment, such as a microscope and slides, and a series of lessons or assignments for study and written work. In 1955 an estimated 2 million persons were studying by mail.

When properly planned and administered, correspondence study can be as effective as class instruction in many subjects, including languages, mathematics, science, literature, philosophy, history, and similar subjects involving rote memory and abstract concepts. It is less useful for the teaching of manual skills, although it is often used for that purpose. The primary factors affecting successful learning by mail appear to be the motivation of the individual and the amount of personal attention given by the instructor.

Correspondence study began in Europe in the nineteenth century but did not gain wide popularity in the United States until the 1880s, when William Rainey Harper, American educator and Hebrew scholar, began teaching Hebrew and theology by mail to Sunday school teachers who attended Chautauqua summer courses. (See Chautauqua.) When Harper became first president of the University of Chicago in 1892, he established the home-study department, which became the oldest university correspondence study agency in America. See Chicago, University of; Harper, William Rainey.

Institutions Offering Courses. The United States Armed Forces Institute, founded in 1942, is the largest correspondence institution in America, offering to members of the armed forces, at no charge, a wide variety of academic and vocational courses from grade school to junior college level. In addition, contracts between USAFI and some 40 co-operating colleges and universities enable service personnel to take college correspondence courses at greatly reduced fees. See Military and Naval Education.

An immense variety of correspondence courses are available in college, high school, and vocational subjects. Among the larger proprietary schools are International Correspondence School of Scranton, Pa.; the American School, the LaSalle Extension University, and DeVry Technical Institute, all of Chicago; and the National Radio Institute of Washington, D.C. Most state universities, many teachers' colleges, and a few private universities offer regular college work by mail; among the largest programs are those of the universities of California, Nebraska, Oklahoma, Washington, and Wisconsin.

Institutional Organization. Correspondence departments of accredited colleges and universities work together through the correspondence study division of the National University Extension Association, with headquarters at Indiana University, Bloomington, Ind. The NUEA *Guide to Correspondence Study* lists courses offered by NUEA members. Credit earned by correspondence from accredited institutions is generally accepted toward undergraduate degrees and by certifying agencies, such as state departments of education. However, it is not possible to earn a recognized degree by correspondence study alone. The approximately 40 reputable proprietary schools are organized into a trade association, the National Home-Study Council, Washington, D.C., which publishes an annual *Blue Book* of members and courses offered. In 1955 the Council established an accrediting commission to upgrade the instructional quality and business practices of its member schools. See Adult Education. Leonard S. Stein

CORRÈZE, department, S France, in the Massif Central of Limousin, bounded by the departments of Haute-Vienne and Creuse on the N, Puy-de-Dôme and Cantal on the E, Lot on the S, and Dordogne on the W; area 2272 sq. mi., pop. (1954) 242,798. The topography of the northern part of Corrèze is rolling, containing the highest elevations and the Plateau of Millevaches; the south is a fertile lowland. The department is drained by the Corrèze, the Dordogne, and the Vienne rivers. It is primarily agricultural producing rye, wheat, barley, vegetables, fruit, and tobacco; grazing is also important. Truffles are found near Brive, the largest city. Other important towns are Tulle, the capital, and Ussel.

CORRIB, LOUGH, lake, W Ireland, in S County Mayo and W County Galway. The lake is about 26 miles long and from 1 to 10 miles wide; its total area is nearly 70 square miles. Lough Corrib is linked, partly by underground river, with Lough Mask to the north and discharges south into Galway Bay. Lough Corrib contains numerous islands and, with adjacent waterways, forms part of a local navigation system.

CORRIENTES, province, NE Argentina, bounded by the provinces of Chaco and Santa Fe on the W, Entre Ríos on the S, and Misiones on the NE, Paraguay on the N, Brazil on the E, and Uruguay on the SE; area 34,500 sq. mi.; pop. (1955) 617,424. Corrientes forms part of the Mesopotamia region of Argentina between the Paraná River on the west and north, and the Uruguay River on the east. It is a low, marshy area with numerous lakes and a subtropical, humid climate. Northern Corrientes is densely forested, providing an important source of lumber, maté, and quebracho. Other products of the province include rice, tobacco, fruits, corn, cotton, tung oil, sugar cane, and peanuts. Cattle and sheep are the principal livestock. Industries of the province, mostly concentrated in the capital city of Corrientes, principally involve the processing of agricultural produce. The province was a battleground in the war with Paraguay in 1865.

CORRIENTES, city, NE Argentina, capital of the province of Corrientes, on the Paraná River, about 490 miles N of Buenos Aires. Corrientes is a major river port, communications center, and market for an agricultural area. Local products include rice, tobacco, fruits, cotton, sugar cane, lumber, maté, quebracho, and cattle. Leading industries in the city are meat packing, the processing of agricultural produce, tanning, pottery making, and the manufacture of textiles. Corrientes has a museum, government buildings, a branch of the national university (founded 1922), and several other institutions of learning. The church of La Cruz is a pilgrimage center for Roman Catholics. Other interesting churches are the Las Mercedes and the cathedral. The city was founded in 1588. Pop. 56,425.

CORRODENTIA, an insect order characterized by gnawing mouth parts and slender antennae. Known also as booklice, Corrodentia are very small and have four membranous wings which are folded in rooflike fashion over the back when the insect is at rest. Certain species are wingless, but wing vestiges indicate that this is a degenerate condition. Metamorphosis is gradual. About 800 species of this order are known and fossils date from Permian deposits. See Geologic Time.

CORROSION is an electrochemical process involving the oxidation of metals (see Electrochemistry). Many of the most useful metals undergo slow chemical change when exposed to air, water, acids, or salt solutions. Such action results first in the formation of a coating on the surface of the metal, causing it to lose its characteristic metallic luster. As the action progresses the coating often breaks away, permitting the corrosive action to penetrate deeper into the metal. Corrosion of metals gradually lessens their period of usefulness and results in losses of hundreds of millions of dollars annually.

Rusting of iron is a familiar corrosion process during which the surface of the metal undergoes a chemical change that results in loss of metallic luster, a pitted and eroded surface, and scales of chemically combined iron, that is, iron oxide or rust (see Rust). The net result of corrosion is the continual deterioration of the metal's surface and appearance, and loss of structural strength. Although the rate of corrosion is greatly dependent upon environmental conditions, the rusting of iron or steel is noticeable even after a relatively short time. It is estimated that about one-sixth of the world's production of iron is used to replace iron that has lost its usefulness because of corrosion. See Anticorrosion Protection.

Cause. Corrosion of metals is caused chiefly by the action of oxygen, water, and carbon dioxide. None of these agents alone is capable of corroding iron. Dry air and pure water which contains no dissolved gases have no effect on iron, but in the presence of both air and moisture iron corrodes rapidly. Water containing dissolved carbon dioxide readily attacks such metals as iron and lead. The presence in the air of gases such as hydrogen sulfide and sulfur dioxide also causes some metals to corrode. Silver does not combine with oxygen when exposed to air or when heated in air. The tarnishing of silver is caused by the action of sulfur compounds in the air or in foods, forming black silver sulfide.

When pure, a metal usually resists corrosion better than when it is impure. Wrought iron, the purest form of commercial iron, resists corrosion much better than does ordinary iron or steel. When two different metals are in contact, one of the metals usually rusts rapidly. Iron coated with tin, a less active metal, corrodes very rapidly when the surface of the metal is perforated so that the iron becomes exposed. Metals usually corrode more rapidly when their surfaces are rough. The existence of stresses in metals, as when they are bent or twisted, and the presence of stray electric currents also hasten corrosion. The presence of dissolved impurities in water often results in the formation of free acid and the water becomes highly corrosive to metals. Magnesium salts, such as chloride or sulfate, are commonly present in natural water. Such water is corrosive in proportion to the quantity of such dissolved matter.

The corrosion of metals exposed to air is generally explained by the electrochemical theory of corrosion. Chemically active metals, such as iron, have a tendency to form ions in the presence of water (see Ion). If a substance such as oxygen is present to form a stable product with these ions, corrosion will proceed.

$$4Fe + 3O_2 \xrightarrow{H_2O} Fe_2O_3$$

This action sets up an electrical potential between the purer iron and other parts of the metal. The coating of rust which forms on the surface of the iron does not act as a protective coating because it is porous, retains water, and thus permits the corrosive action to spread.

Although corrosion is usually a highly destructive process, the conversion of lead into basic lead carbonate or white lead, which is extensively used in paint, is an example of useful corrosion.

Self-protecting Metals. Some metals in corroding form protective coatings on the surface which protect the rest of the metal from further action. Aluminum, a very active metal when pure, appears to be immune to corrosion because the pure metal oxidizes rapidly on exposure to air to form a transparent, continuous film of aluminum oxide about one ten-millionth of a millimeter thick. This lacquer-like film protects the rest of the metal. Zinc and chromium form similar protective coatings. Pure lead when exposed to air becomes discolored by corrosion to form a coating which gives an excellent protection to the remainder of the metal. Copper, brass, and bronze when exposed to moist air form a protective coating which consists chiefly of basic carbonate, which is light green. Silver combines with chlorine to form a thin layer of silver chloride which acts as an effective protective coating against further action.

CORROSIVE, any substance that destroys living tissue by dissolving it, precipitating the tissue proteins, oxidizing tissue constituents, removing water from the cells, or simply by digesting the tissue proteins. Substances classified as corrosives include the following: (1) acids such as mineral acids, lactic acid, trichloracetic acid; (2) alkalies such as caustic soda, potash, lime, sulfides; (3) mineral salts such as silver nitrate, copper sulfate, potassium aluminum sulfate, zinc chloride; (4) artificial corrosives such as formaldehyde and phenol; and (5) vegetable corrosives such as thujone and papain.

Medically, corrosives have been used on the skin and easily accessible mucous membranes in order to remove crusts, excessive granulation tissue, warts, polyps, false membranes, soft tissue, and chancre sores. They have also been used to sterilize bites of poisonous animals.

When taken orally corrosives produce severe and often fatal poisoning. Symptoms include irritation and burning sensation in the mouth, inability to swallow, and acute inflammation of the lining of the stomach and intestines. Treatment of corrosive poisoning consists of administration of a proper antidote (see Poison). Generally, weak acids such as vinegar may be used to counteract alkalies and milk of magnesia or bicarbonate of soda to counteract acids. The antidote should be followed by careful irrigation of the stomach and the administration of soothing liquids such as olive oil, starch, water, or the white of eggs. See Caustic.

Theodore Koppanyi

CORROSIVE SUBLIMATE, bichloride of mercury. See Mercury; Poison.

CORRUPT PRACTICES ACT, a federal law of 1925 designed to limit the use and influence of money

in political campaigns and elections by setting a maximum of $10,000 that can be spent by a candidate for the Senate and $2500 for a candidate to the House of Representatives. An alternative rule allows each candidate to spend up to three cents for each vote cast for all candidates for the given office in the preceding general election, with a maximum of $25,000 for a senatorial candidate and $5000 for a candidate for the House. The amending Political Activities Act of 1940 provided that no national political committee may receive or spend more than $3 million annually.

The federal Corrupt Practices Act is one of a series of federal and state laws, commonly designated as corrupt practices laws, whose purpose is to protect integrity of elections. While differing in detail, these acts invariably prohibit bribery, treating, intimidation, or impersonation of voters, stuffing of ballot boxes or tampering with voting machines, and other fraudulent practices directed at altering the results of an honest election, securing special favors from the elected officials, or preventing the passage or enforcement of unfavorable laws. Corrupt practices legislation extends to most phases of party finances, including acts (such as making contributions) not inherently corrupt but becoming improper when and to whatever extent prohibited by law. Thus federal employees may not be assessed or solicited for contributions for political purposes and their political activity is curtailed by laws, especially the Hatch Act of 1939. Federally or state chartered corporations and banks are barred from making contributions to political campaigns. Similarly, the Taft-Hartley Act of 1947 prohibits contributions or expenditures by labor unions in connection with political campaigns, caucuses, conventions and elections. Under the Hatch Act no individual, committee or association may contribute more than $5000 per year to the campaign of any candidate for a federal office.

Federal and state laws also limit the purposes for which money may be spent by candidates, and require that all receipts and expenditures of the candidates for a federal office be filed with the proper authorities and published both before and after election; similarly, all party committees must under oath make full periodic reports of their financial operations.

In practice, laws regulating money raising and money spending for political purposes did not prove successful. Wholesale evasion of them and the difficulty of enforcing them led many writers to suggest various changes including the public financing of election campaigns, to bridge the span between the laws and political behavior. See Election; Hatch Act; Political Machine.

CORRY, city, NW Pennsylvania, in Erie County, on a tributary of the Allegheny River, on the Erie and the Pennsylvania railroads, and on U.S. Highway 6; 25 miles SE of Erie. In Corry are manufactured airplane parts, springs, engines, metal furniture and tool steel. Corry was settled in 1861 on land originally granted in 1833 to a land company formed in Holland. Pop. (1950) 7911.

CORSAIR, a seaman engaged in preying on commerce, especially one of those sent out by the rulers of the North African Moslem states to attack ships and raid the coastal towns of the Mediterranean. Among the most famous Turkish corsairs were Barbarossa and his brothers and successors, who caused both loss and terror among Christians in the Mediterranean in the early sixteenth century. With strongholds in Algiers, Tunis, and other cities, the corsairs continued to raid Mediterranean shipping until the nineteenth century. Modern usage often regards corsairs as pirates, but the corsairs of the North African states were carrying out a policy of their rulers, often with official commissions. See Barbary States; Piracy.

PIX, INC.

Capital of the French possession of Corsica, Ajaccio is famed as the birthplace of Napoleon I. A winter resort, it also has extensive fishing and shipbuilding industries.

CORSICA or **CORSE,** island in the Mediterranean Sea, forming a department of France, lying S of the Gulf of Genoa, 105 miles SE of France, and 55 miles W of Italy. It is separated from Sardinia to the S by the narrow Strait of Bonifacio; area 3367 sq. mi.; pop. (1954) 244,000. Corsica is some 115 miles long from north to south and has a maximum width of slightly more than 50 miles. It is roughly oval in shape with the Cape Corse Peninsula projecting from the northeastern part of the island. Corsica is generally mountainous and rugged, rising to Monte Cinto (8891 ft.), which is the highest point on the island, and Monte Rotondo (8775 ft.). Lowlands occur only around the coast, principally along the unindented eastern coast; the western coast line is indented and rugged. The island has a Mediterranean type of climate with hot summers and mild rainy winters. The higher sections of the mountainous interior experience cooler summers and more severe winter conditions, with winter snow covering the peaks. Vegetation consists principally of dense brush, or maquis. Some forests of chestnut, beech, oak, and fir occur. Agriculture is the main occupation, and olives, cereals, citrus fruits, wine grapes, vegetables, and tobacco are the leading crops. Sheep and goat raising is generally important. Fishing for tuna, anchovy, lobster, and sponges is also a major activity. Corsican mineral wealth includes arsenic, antimony, asbestos, and building stone; other island products are silk, cork, chestnuts, and lumber. There is little industry in Corsica apart from the processing of agricultural produce. Most of the population is gathered in the coastal areas. The leading centers are Ajaccio, the capital, located on the west coast; Bastia, the largest city, on the northeast coast; L'Île-Rousse and Calvi, on the northwest coast; and Bonifacio, on the south coast. Corte and Sartène are the only important interior towns. French is spoken in the towns and an Italian dialect is used in the rural areas. Transportation on the island is poorly developed although a railroad links Ajaccio, Calvi, Bastia, and Porto-Vecchio.

The early inhabitants of Corsica were probably Ligurians and in the sixth century B.C. the island was colonized by Phoenicians. These were replaced by Etruscans, then Carthaginians, and by Romans after the third century B.C. After the disintegration of the Roman empire, Vandals occupied Corsica from the fifth to the ninth century A.D. Next to control Corsica were Arabs, who held the island from the ninth to the eleventh century. In 1077 Corsica came under the rule of the Pisan republic and entered a period of prosperity which diminished in the face of mounting disorder. After the twelfth century Genoa struggled to gain control of the island and finally expelled the Pisans in 1312. The Geno-

ese rule of Corsica was marked by great turbulence and lawlessness. In the absence of effective administration banditry flourished and the inhabitants waged protracted feuds, or vendettas, which remained a feature of Corsican life until late in the nineteenth century. In 1755 Pasquale Paoli, the Corsican national hero, instituted an effective revolt against the declining power of Genoa and most of the island passed to insurgent control. The Genoese, recognizing defeat by the Corsicans, entered into a treaty with France in 1768 by which the island came under French control. The Corsicans were reluctant to accept French sovereignty but were unsuccessful in resisting. Paoli proclaimed Corsican independence in 1794, forcing Napoleon Bonaparte, leader of pro-French Corsicans, to flee to France. Aided by the British, the island revolted against French rule in 1794 and in the same year the Corsican assembly voted to become a British protectorate; two years later the French recaptured Corsica. The British regained the island briefly in 1814 but in 1815 restored it to French rule. During World War II Corsica was occupied by German and Italian forces in 1942 but was liberated toward the end of 1943.

CORSICANA, city, E Texas, county seat of Navarro County, on the Fort Worth and Denver, the Rock Island, the St. Louis Southwestern, and the Southern Pacific railroads; on U.S. highways 75 and 287; 50 miles SSE of Dallas. Corsicana is situated in a petroleum-producing region; its surrounding agricultural area produces cotton, corn, cattle, and sheep. Its principal manfactures are oil machinery, hats, and food and dairy products; cotton and cottonseed products are also processed. Corsicana was an early leader in the Southwest's petroleum industry. In 1895 oil was discovered near Corsicana in a well being drilled for water. The city was named for the island of Corsica. Pop. (1950) 19,211.

CORT, CORNELIS, 1536?–78, Dutch engraver, was born in Hoorn, Holland. He studied under Hieronymus Cock in Antwerp, and in 1566 moved to Venice, where he came under the influence of Titian. In 1571 he established a school for engravers in Rome and became the first to use large-sized engraving plates. Agostino Carracci and Philippe Thomassin were among his pupils. Cort is best known for his engravings of the paintings of Titian, Raphael, Michelangelo, Clovio, Correggio, and other masters.

CORTE, town, France, central Corsica, on the Tavignano River, 35 miles NE of Ajaccio. Corte is located in the mountainous interior of the island and is one of the few Corsican towns not situated on the coast. It is the market center for an area producing cereals, olives, fruits, vegetables, and wine. Marble is quarried in the vicinity. During the insurrection of 1755–68 Corte was the seat of the revolutionary government. Pop. (1954) 4369.

CORTELYOU, GEORGE BRUCE, 1862–1940, U.S. lawyer and political leader, was born in New York City. Educated at Massachusetts State Normal School and Georgetown University, he was secretary to Presidents William McKinley and Theodore Roosevelt, and was the first secretary of the U.S. Department of Commerce and Labor, 1903–04. He was postmaster general, 1905–07, and secretary of the treasury, 1907–09.

CORTE-REAL, GASPAR, 1450?–?1501, Portuguese explorer, sent by King Manuel I to search for the Northwest Passage, 1500. He explored the coast of Labrador and Newfoundland and is thought to have discovered Greenland. On a second voyage, 1501, he sent two ships back in charge of his brother, Miguel Corte-Real, but never returned himself.

CORTE-REAL, JERONYMO, 1533–88 Portuguese soldier, poet, and painter, was born of a noble family. After serving as a soldier in Africa and in Asia, Corte-Real became director of the Misericórdia of Évora, Portugal, in 1586. His epic *O Segundo cêrco de Diu* (1574) tells of the siege of a Portuguese island. Written in Spanish and dedicated to King Philip II of Spain, his *Austríada* (1578) commemorated Austria's victory over the Turks at Lepanto. *Naufrágio de Sepúlveda*, published after Corte-Real's death, is considered his best work. One of his paintings is preserved in the church of Sant' Antão at Évora.

CORTÉS, HERNÁN, or Hernando Cortez, 1485–1547, Spanish conqueror of Mexico, was born in Medellín, Estremadura, Spain. Cortés studied at the University of Salamanca, but his penchant for women and adventure caused him to leave Spain in 1504. After fighting the Indians in Santo Domingo, he joined Diego Velásquez in the expedition that conquered Cuba, 1511. Cortés became mayor of Santiago de Cuba but in 1518 was given command of an expedition to Yucatán by Velásquez, who had heard that fabulous treasures had been discovered on the mainland. Velásquez later countermanded the order but Cortés had already sailed. Reaching the coast of Yucatán, he fought the Indians at Tabasco and early in 1519 landed at San Juan de Ulúa. There he met Marina, a slave girl who became his interpreter, guide, counselor, and mistress. Later he founded Veracruz, renounced Velásquez, and destroyed his fleet to prevent desertion by his limited forces.

BETTMAN ARCHIVE
Hernán Cortés

Learning of smoldering unrest in the Aztec empire, Cortés started inland. Confronted by the Tlascalans, he defeated their warriors who, after a few skirmishes, came to respect his generalship. Becoming his allies, the Tlascalans gave Cortés the loyal support he needed to achieve his conquest. Thus strengthened, the expedition captured and sacked Cholula, recruited the natives, and marched on Mexico. Encountering no opposition from the emperor Montezuma, Cortés entered the Aztec capital, Tenochtitlán (later Mexico City), on Nov. 8, 1519. Soon after having established himself in sumptuous surroundings, Cortés heard of a plan to drive him from the city. He seized Montezuma and sought to govern the Aztecs through this hostage. In April 1520, Cortés received word that an expedition sent from Cuba had arrived at San Juan de Ulúa. He marched toward the coast and in a surprise attack captured Pánfilo de Narváez, the commander. Upon his return he found the Aztecs in revolt against Pedro de Alvarado, a lieutenant left in command who had needlessly killed some of the Aztec leaders. Cortés and his men were permitted to enter the city, but fighting was resumed and Montezuma was killed. The Spaniards and their allies fought their way out of the city on the night of June 30, 1520, known as *la noche triste* (sad night). Cortés retreated to Tlaxcala, after having routed superior pursuing Aztec forces at Otumba, July 7. With half of his men and most of his booty gone, Cortés reassembled an army of natives (by persuasion, threat, and force), and by October was ready for a second march on Mexico. Capturing Aztec outposts along the way, Cortés arrived in April 1521, to lay siege to the capital. Much of the city was destroyed and the long siege was finally brought to an

end by house-to-house fighting and the capture of Guatemotzin, the Aztec chieftain, on Aug. 13, 1521.

With the conquest of Tenochtitlán, Cortés assumed control of the Aztec empire. The city was rebuilt, agriculture and mining were developed, and Cortés was named captain general, with authority to conquer all of New Spain. Appointed governor in 1523, he sent out expeditions which added Guatemala and Honduras to the Spanish domain. In 1524 Cortés himself led troops to Honduras, where they put down a revolt and killed Guatemotzin. When he returned to Mexico in 1526 Cortés found his enemies in control of the government. Deposed as governor in the same year, his prestige waned and he was called back to Spain, 1528. Although he was created Marquis of the Valley of the Oaxaca and reappointed captain general, King Charles V refused to restore him as governor. In 1530 Cortés returned to Mexico, explored the Pacific Coast, and discovered Lower California, 1536, only to have his property in Spain confiscated. He returned to Spain in 1540 and was shipwrecked while on an expedition to Algiers the following year. Failing in a final attempt to regain his property, Cortés retired to brood over his misfortunes. G. P. M.

CORTES is a unicameral legislature in Spain, elected prior to 1939 by a democratic vote system; since 1942 rebuilt according to the corporative principle. See SPAIN; PORTUGAL.

CORTEX is the outer portion of certain organs of the body, some plants and fruits, and a few sponges. Such body organs as the kidneys, adrenals, and cerebrum have a cortex. In plants, the cortex is the covering of the stem or trunk, such as bark and cork. In pharmacy, cortex includes not only the bark of plants but also the outer covering of certain fruits, such as orange peel. The cortex of certain sponges, particularly the tetractinellids, is well developed. See KIDNEY; ADRENAL GLANDS; BRAIN; BARK; CORK; SPONGE.

CORTINA D'AMPEZZO or **CORTINA,** city, N Italy, in the province of Belluno, 37 miles E of Bolzano. Cortina d'Ampezzo is picturesquely located at an elevation of about 4000 feet in the Dolomites and forms a summer and winter resort center. There is some manufacturing in the town, principally the making of furniture, wood products, footwear, and wrought-iron work. The winter Olympic Games were held at Cortina d'Ampezzo in 1956. Pop. (1954) 3900.

CORTISONE, one of the biologically active substances secreted by the cortex of the adrenal glands (see ADRENAL GLANDS) to control various body functions. This hormone is one of the 30 or more adrenocortical steroids (see STEROL), only a few of which have been found to be biologically active, that is, to influence body function directly.

Chemically cortisone, or 17-hydroxy-11-dehydrocorticosterone, belongs to the group known as the 11, 17-oxysteroids. Hydrocortisone, or 17-hydroxy-corticosterone, is also one of this group. These compounds particularly affect carbohydrate, protein, and fat metabolism. Other adrenocortical steroids, while also exerting some influence on these body processes, are more notable for their effect on water and electrolyte balance. See ACTH; BLOOD, Blood Plasma, *Salts*.

The individual adrenocortical steroids influence to a varying degree the heart and circulatory system, muscle function, the central nervous system, lymphoid tissue, and the formed elements of the blood; hence a deficiency of these steroids or the administration of one or all of them may profoundly affect the body generally. Furthermore, there is evidence that physiological stress is also affected by these steroids.

Cortisone has been used successfully in the relief of Addison's disease, rheumatoid arthritis, bronchial asthma, psoriasis, and a number of other diseases (see ARTHRITIS; ASTHMA; PSORIASIS). It can be administered either orally or by injection. Since cortisone therapy over a prolonged period of time produces such drastic side effects as severe obesity, high blood pressure, hirsutism, edema, and in some cases mental disturbances, it must be controlled by the physician. Upon withdrawal of the hormone, these side effects disappear. See ENDOCRINE GLANDS.

CORTLAND, city, central New York, county seat of Cortland County, on the Tioughnioga River, on the Delaware, Lackawanna, and Western, and the Lehigh Valley railroads; on U.S. Highway 11; 30 miles S of Syracuse. Cortland is situated in a region famous for its Holstein-Friesian cattle, large turkey farms, and the growing of beans. The principal manufactures are wire cloth, metal and paper products, sporting goods, clothing, wood products, and trucks. Cortland is the site of a state teachers college. Elmer Sperry, the inventor, was born here. Pop. (1950) 18,152.

CORTONA, town, central Italy, in Tuscany region, in the province of Arezzo, 50 miles SE of Florence. It is an agricultural market center with some minor industry, principally the manufacture of food products. Cortona was one of the leading Etruscan centers and contains noted Etruscan remains. These include fortifications, a burial chamber, and a large collection of relics in a museum. Other features of interest are the remains of Roman baths, a medieval citadel, several ancient churches, and the Diocesano Museum, which features paintings by Fra Angelico. Pop. (1954) 4000.

ÇORUH, also Chorokh, formerly Artvin, province, NE Turkey, in Turkish Armenia, bounded by the Black Sea on the NW, by the U.S.S.R. on the N, and by the provinces of Kars on the E, Erzurum on the S, and Rize on the SW; area 3076 sq. mi.; pop. (1955) 176,888. Apart from a narrow coastal plain most of Çoruh is mountainous, with peaks rising above 10,000 feet. The principal stream is the Çoruh River, draining to the Black Sea. Agriculture is practiced on the coastal plain and interior valleys. Leading crops are grains, fruits, tobacco, and vegetables. The uplands are a source of lumber and provide pasture for livestock, principally sheep. Minerals in Çoruh include manganese, lead, and copper. Artvin is the capital.

ÇORUM, or Chorum, province, N central Turkey, bounded by the provinces of Kastamonu and Sinop on the N, Samsun and Amasya on the E, Yozgat on the S, and Ankara and Çankiri on the W; area 4245 sq. mi.; pop. (1955) 403,527. Çorum is generally mountainous but has fertile river valleys, including those of the Kizil Irmak and Delice rivers. Agriculture is the leading occupation, with grains, hemp, fruits, and vegetables the principal crops. Goats and sheep are the most important livestock. Çorum, the capital of the province, is an important commercial town. Leather goods and pottery are manufactured in the town of Çorum.

CORUMBÁ, city, S central Brazil, in the state of Mato Grosso, on the right bank of the Paraguay River, 255 miles SSW of Cuiabá. Corumbá is an important commercial and communications center on the railroad from São Paulo, Brazil, to Santa Cruz,

Cortina d'Ampezzo, a popular holiday resort in winter and summer, located in the heart of northern Italy's Dolomite mountains, was the site of the 1956 Winter Olympic Games.

WIDE WORLD

Bolivia. It is also a busy river port linked with the interior of Mato Grosso and the Río de la Plata. Exports from Corumbá include cattle, lumber, meat, hides, natural rubber, iron ore, manganese, gold, and diamonds. Industries include the manufacture of iron and steel, metal products, lumber, and food products. There is an airport and customhouse. The city was founded in 1778. Pop. (1950) 19,211.

CORUNDUM is the second hardest naturally occurring mineral. It is composed of alumina, Al_2O_3, (see ALUMINA) and crystallizes in the hexagonal system (see CRYSTALLOGRAPHY). Also produced artificially from bauxite (see BAUXITE), corundum has a hardness of 9 (see HARDNESS) and a specific gravity of about 4.2. Opaque granular corundum, when mixed with hematite, magnetite, or hercynite, is known as emery. Because of their extreme hardness and crystalline structure, corundum and emery are used chiefly for polishing optical glass and other special abrasive purposes, and are also used as jewel bearings in watches and fine instruments, phonograph needles, and thread guides. See ABRASIVE; EMERY.

Transparent varieties of corundum are known as ruby if they are red, and as sapphire if they are another color. The sapphire proper is blue; other colored corundum is properly known as violet sapphire, yellow sapphire, or green sapphire. Gem corundum is called oriental amethyst, oriental topaz, or oriental emerald. The best known deposits of corundum are in Canada, India, Kashmir, the Transvaal, Madagascar, U.S.S.R., and the United States—chiefly in North Carolina, Georgia, and Montana.

CORUNNA or **LA CORUÑA,** province, NW Spain, in Galicia, bounded by the Atlantic Ocean on the N and W, and by the provinces of Lugo on the E and Pontevedra on the S; area 3051 sq. mi.; pop. (1950) 971,641. Corunna has a very rugged, deeply indented coast. Numerous short streams that rise in the low Galician Mountains cross the province to the Atlantic; these include the Tambre and Ulla rivers. Corunna has a mild, damp climate and forms the most humid portion of Spain. Agriculture is the main occupation in the province; grains, potatoes, vegetables, and fruits are the principal crops. Cattle, hogs, and horses are the most important livestock. Fishing and the preserving of fish is a major activity around the coast. Mineral resources of the province include lignite, tin, and tungsten. Industries in the province are principally the manufacture of food products, textiles, leather, and small vessels. Corunna is the provincial capital.

CORUNNA or **LA CORUÑA,** called "The Groyne" by British sailors, city, NW Spain, in Galicia, on Coruña Bay of the Atlantic Ocean, 315 miles NW of Madrid. The city is located on a tongue of land north of Coruña Bay with the old section on the promontory and the new section on the mainland. There are good dock facilities and Coruña Bay affords a deep, natural harbor; the port is mainly important for its fishing fleet. Exports include fish, agricultural produce, livestock, and wine. Manufactures in Corunna include fish products, tobacco, chemicals, textiles, boats, metal goods, and food products. Features of interest in the city are several ancient churches, a modern town hall, and picturesque houses. Of Celtic origin, Corunna was an important Roman center known as Brigantium. The Romans built the Tower of Hercules, containing a navigation light, at the end of the promontory on which the city is located. During the Middle Ages, Corunna was under Moorish and Norman control. In 1588 the Great Armada sailed for England from Corunna and in 1598 Sir Francis Drake sacked the city. In 1809, during the Peninsular War, a British army made a successful embarkation from the city after defeating a superior French force under Marshal Nicolas Soult. The British General Sir John Moore was killed in the battle and is buried in the city. Pop. (1950) 127,618.

CORVALLIS, city, W Oregon, county seat of Benton County, on the left bank of the Willamette River, on the Southern Pacific Railroad and on U.S. highways 20 and 99 W; 29 miles SSW of Salem. Corvallis lies in the Willamette Valley and produces dairy products, fruits, grains, and lumber. It is the site of Oregon State College. The city was settled after the acquisition of the Oregon country in 1846. Pop. (1950) 16,207.

ITALIAN EMBASSY

The Italian Corvette *Albatros*

CORVETTE, a light naval vessel. In the days of sail it was usually a ship-rigged sloop of war, carrying only one deck of guns. Smaller than frigates, corvettes performed patrol, reconnaissance, and escort duties, and sometimes raided enemy commerce.

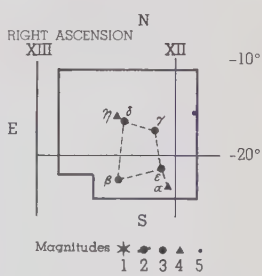
During World War II corvettes were a type of escort ship, used principally for convoy protection in the Atlantic by the British, United States, and Canadian navies. Built to a design based on the Norwegian fishing trawler, they were about 193 feet long, displaced about 800 to 1000 tons, had speeds of 15 to 18 knots, and usually carried one 4-inch gun, a multiple pom-pom, and machine guns and depth charges. Very seaworthy, the inexpensive, easy-to-build corvettes proved effective in combating submarine attacks on merchant shipping.

CORVEY, a famous Benedictine abbey in N central Germany, now in North Rhine-Westphalia, along the Weser River near Höxter, 26 miles E of Paderborn. The abbey was founded and endowed about 822 by Emperor Louis I, and gained its name because many of the first monks came from Corbie in Picardy. Corvey became a center of missionary activity in northern Europe and was a nursery of classical studies. The library formerly had many valuable books and manuscripts. Corvey became a bishopric in 1783, but was secularized in 1803. In 1815 it passed to Prussia.

CORVINUS, MATTHIAS. See MATTHIAS CORVINUS.

CORVO ISLAND, northernmost and smallest island in the Azores, in the Atlantic Ocean, about 1150 miles W of Lisbon, Portugal; area 7 sq. mi.; pop. (1950) 729. The island is volcanic in origin and has fishing and dairying industries.

CORVUS, MARCUS VALERIUS, 371?–?271 B.C., Roman general, was twice dictator of Rome, 342, and 301 B.C., and six times consul, 348 to 299. His greatest military achievements were two victories over the Samnites in 343 B.C.



Constellation Corvus

CORVUS, the Crow or Raven, is a small southern constellation (see CONSTELLATION) that comes to the meridian at 9 P.M. about May 5. Its quadrilateral of rather bright stars looks very little like the crow or raven that is supposed to be perched on the back of Hydra, the Serpent. See ASTRONOMICAL CATALOGUE.

CORWIN, THOMAS, 1794–1865, U.S. political leader, was born in Bourbon County, Ky., and in 1798 was taken by his family to Lebanon, Ohio, where he became a lawyer. He was a member of the Ohio legislature, 1821, 1822, and 1829; (Whig) congressman, 1831–40; governor of Ohio, 1840–42; U.S. senator, 1844–50; and secretary of the treasury, 1850–53. He served in Congress as a Republican, 1859–61, and was minister to Mexico, 1861–64.

CORYBANTES, in mythology, beings who attended the goddess Cybele or Rhea and who celebrated her worship with orgiastic dances to the music of the cymbals and drum. Corybantes differed from the Curetes in that they did not dance in armor. The priests of Cybele imitated the dances of the Corybantes, and were themselves sometimes called Corybantes. The Corybantes were also part of the cult of Zeus, and were said to have nursed him in Crete, drowning his cries with their music lest his father Cronos hear him.

CORYDALIS, or dobson fly, is a ferocious-looking insect belonging to the family *Corydalidae*. The larvae of the corydalis, *Corydalis cornutus*, are commonly called hellgrammites and are highly prized as fish bait by anglers. The adult dobson fly is a greenish-brown insect about 2 inches long, with four wings having a spread of almost 5 inches. The female has powerful biting jaws, and lays her eggs in chalky white masses on the leaves of trees near the water. As the eggs hatch, the young drop into the water and remain on the bottom as larvae for two to three years. When fully grown the larvae leave the water, locate themselves under some stone or log, pupate, and emerge as adults in about a month.

CORYDON, town, S Indiana, county seat of Harrison County, on Indian Creek, on the Louisville, New Albany, and Corydon Railroad, on U.S. Highway 460; 21 miles W of Louisville, Ky. Corydon's industries include dairying and the manufacture of furniture and glassware. Indiana's first state capitol building is located in Corydon. It was the seat of the territorial government from 1813 to 1816 and of the state government until 1825. The Battle of Corydon was fought near the town in July 1863 between General Morgan's Confederate Raiders and the Corydon Home Guards. Pop. (1950) 1944.

CORYLUS is a genus of nut-producing shrubs and small trees native to the North Temperate zone. See FILBERT.

CORYMB is an arrangement of flowers in which a short, flat-topped, indeterminate flower cluster is evident. The outer flowers open first. It is so named because it can continue to flower as long as conditions are favorable. The pedicels, small stalks which bear each flower, are longer in the outer rim, becoming shorter and more crowded toward the center. Plants exhibiting this type of arrangement include the catalpa. See FLOWER.

COS or **KOS,** Italian Coo, second largest of the Dodecanese Islands, SE Greece, in the SE Aegean Sea, off the coast of SW Turkey, at the entrance to the Gulf of Cos, 50 miles NW of Rhodes; area 111 sq. mi.; pop. (1951) 19,076. Most of the island is made up of fertile plain, with uplands in the eastern section rising to nearly 3000 feet. Cos experiences hot summers and mild winters. The precipitation is light and occurs mainly during the winter season. Agriculture is the leading occupation; wheat, barley, corn, tobacco, sesame, cotton, olives, fruits, and vegetables are the main crops. Irrigation is widely practiced. Sheep, goats, and cattle are the principal livestock. Fishing, including sponge fishing, is important on the island. Mineral resources of Cos include copper, lead, iron ore, and coal. The capital and principal city of the island is Kos, located on the northeastern coast. The islanders are predominantly Greek. Rich archaeological remains include numerous ancient Greek buildings. There are several medieval fortresses built by the Knights Hospitallers.

BURTON HOLMES EWING GALLOWAY

White buildings line the streets of Kos, capital of Cos, second largest of the Dodecanese Islands. The group was ceded to Greece by the treaty of peace after World War II.

Cos was colonized by Dorians from Epidaurus. The island subsequently came under the control of Athens, Macedonia, Syria, and Egypt. It achieved great fame as a center of learning and an Aesculapian, or healing, shrine was established; associated with this shrine was Hippocrates, who was born on Cos. The Knights Hospitallers held the island from 1315 until 1523 when it was captured by the Turks. In 1912, during the Italo-Turkish War, Cos was occupied by the Italians. Formal sovereignty of Cos and other Aegean Islands was granted to Italy in 1923 by the Treaty of Lausanne. In 1947 the Dodecanese Islands, including Cos, were ceded to Greece under the terms of the Allied peace treaty with Italy.

COSA, JUAN DE LA, 1460?–1510, Spanish navigator who accompanied Columbus as pilot in 1492, and later was sent on several expeditions to explore the newly discovered lands. He is remembered for two colored maps—one marking out the lands discovered by Columbus and his successors, done about 1500, and the oldest map of the New World known to exist, the other showing Spanish possessions in Africa. Juan died on an island in the Bay of Cartagena.

COSA, ancient town, W central Italy, on the Tyrrhenian Sea; 4 miles SE of Orbetello, 72 miles NW of Rome. Cosa was a Roman military settlement and port on the Aurelian Way. The settlement was thought to be of Etruscan origin until excavations in 1948 proved it to have been of Roman origin, founded about 273 B.C. A number of buildings have been uncovered, including a basilica, senate house, and several temples.

COSECANT. See TRIGONOMETRY, *Trigonometric Functions;* TRIGONOMETRY: CURVES OF FUNCTIONS.

COSELEY, urban district, W central England, in Staffordshire; 10 miles NW of Birmingham. Coseley is a part of the Birmingham industrial district and has steel casting and metal products factories. Pop. (1951) 34,414.

COSENZA, province, S Italy, Calabria, bounded by the provinces of Matera on the N, and Catanzaro on the S, the Gulf of Taranto on the E, and the Tyrrhenian Sea on the W; area 2566 sq. mi.; pop. (1954) 710,000. Cosenza makes up the northern portion of the "toe" of Italy and is generally mountainous. The highlands of La Sila rise to 6329 feet above sea level. Lowlands occur in the river valleys, principally on the shores of the Gulf of Taranto. The major crops of Cosenza are grains, olives, fruits, and wine grapes. Sheep, goats, and hogs are the most important livestock. Lumbering is an important activity in the higher mountain areas. Rock salt is the chief mineral product of the province. Cosenza is the capital.

COSENZA, ancient Consentia, town, S Italy, capital of the province of Cosenza, at the confluence of the Busento and Crati rivers, 150 miles SE of Naples. Cosenza is the market and commercial center

for an agricultural region. Wine, olive oil, and other food products, textiles, furniture, and pottery are the principal manufactures of Cosenza. Features of interest include the ancient castle ruins which dominate the old town, a thirteenth-century cathedral, museum, and numerous old buildings. Cosenza was the capital of the Brutii and, after a period of Carthaginian control, was taken by the Romans in 204 B.C. Alaric I, king of the Visigoths, died in Cosenza A.D. 410 while preparing to attack Rome. The Normans, who founded the kingdom of the Two Sicilies in 1130, made Cosenza the capital of Calabria Citeriore. The Academia Cosentina, one of the oldest existing learned societies, was founded here in the early sixteenth century. Cosenza was captured in September 1943 during the Allied invasion of Italy in World War II. It has suffered numerous earthquakes. Pop. (1954) 49,500.

COSGRAVE, WILLIAM THOMAS, 1880– , Irish political figure, was born in Dublin. He served on the Dublin Corporation as alderman and chairman of the finance committee, 1909–22. Elected a member of the Dail Eireann in 1917, he took a leading part in the Sinn Fein movement and figured importantly in negotiations to settle the Irish question. He was chairman of the provisional government appointed in 1922 and was president of the executive council of the Irish Free State, 1922–32. Later he became a leader of the opposition to Eamon de Valera.

COSHOCTON, city, E central Ohio, county seat of Coshocton County, at the confluence of the Tuscarawas and the Walhonding rivers forming the Muskingum River, on the Pennsylvania and the Nickel Plate railroads; on U.S. Highway 36; 60 miles ENE of Columbus. Coshocton manufactures strawpaper and leather products, metal signs, plastics, porcelain kitchenware, canvas gloves, lighting equipment, celluloid novelties, cast iron pipe, chinaware, and evaporated milk. The city also has flour mills and soy bean processing plants. In the city is the Johnson Jumrickhouse Museum of art, curios, and relics. The surrounding area is rich in relics of Indian mound builders. Pop. (1950) 11,675.

COSIMO, PIERO DI. See PIERO DI COSIMO.

COSINE. See TRIGONOMETRY, *Trigonometric Functions;* TRIGONOMETRY: CURVES OF FUNCTIONS.

COSMETICS are external means, such as chemical or organic substances, mechanical devices, coloring matter, or surgery used to preserve, enhance, or beautify the human body. They may be applied to any part of the body for the purposes of improving the appearance of the skin, adding or altering color, concealing or correcting imperfections, changing body contours, or adding fragrance or deodorizing.

History. Cosmetics have been used by both men and women since earliest times by the most savage peoples as well as by the most advanced. In primitive societies they were often associated with magical rites. Herodotus states that the Babylonians were great users of aromatics, perfuming their bodies with the most extensive scents. Red and white paints composed of vermilion and white lead were common. The women of ancient Egypt blackened their eyebrows, eyelids, and eyelashes with kohl, a material composed chiefly of galena (lead sulfide). Perfumes are referred to in the Bible. In the royal courts, dandies used perfumes and hair or wig whiteners, but during the austere Victorian period, color was sometimes heightened by such limited means as pinching the cheeks or biting the lips.

The first beauty salons of the modern type appeared early in the twentieth century, but these were devoted to beautifying only the wealthy. The mass use and acceptance of cosmetics came only after World War I. They often were crudely applied for the purpose of shocking, rather than to enhance beauty. The art of merchandising cosmetics for a mass market flowered in the decade following World War I. Make-up and creams were sold, not only in salons, but across store counters throughout the country. More intelligent use of cosmetics was fostered when manufacturers began to educate and train salesgirls to recognize skin types, prescribe preparations, and teach customers how to apply them. Training of salesgirls became standard practice and all large cosmetic firms were engaged in this type of training. It was not until World War II, however, that the production, distribution, and use of cosmetics attained high standards on a widespread basis. The enormous increase in the number of employed women, greater emphasis on health and general attractiveness, larger incomes, longer life, and scientific research were factors in raising cosmetic standards.

Composition of Cosmetics. New mechanical processes, better colors, superior solvents, and biological products have been incorporated into the manufacture of cosmetics. Ingredients of cosmetics include zinc oxide, magnesium carbonate, mineral oil, cocoa but-

MAX FACTOR & CO.

For a precision-perfect lip line, the lip pattern should first be drawn to suit the facial contour, as shown, then carefully filled in with a lipstick of flattering shade.

MAX FACTOR & CO.

The heavy black eye make-up (right side of face) shows a bold, hardening effect in contrast with the soft, natural make-up (left side) which enhances the model's charm.

ter, beeswax, borax, stearic acid, lanolin, and fixed vegetable oils such as almond, coconut, and sesame. Hormone cream, introduced in the 1920s, has continued to be a popular biologic preparation in cosmetics. Other drugs and therapeutic developments, such as antibiotics and vitamins, have been incorporated into a variety of creams. In the field of fragrance, the combining of synthetic aldehydes, acetates, and derivatives with natural animal, herb, or flower essences has made possible new perfumes. Esters, mechanical processes, and brilliant colors have improved all make-up preparations. Research in the biology of the hair has also given impetus to hair grooming at home. In men's toiletries, the improvement of shaving and hair preparations has led to an expanding industry. To protect the public, the Federal Food, Drug and Cosmetic Act requires compliance with safety and health regulations, and government agencies keep close check on advertising claims. See Food and Drug Regulation.

Kinds of Cosmetics. Cosmetics can be divided into five general types: treatment, hair, make-up, fragrances, and specialties.

Treatment items consist of creams and lotions. Cleansing creams may contain soil, oil, and color dissolvents. Lubricating creams are superfatted to soften and smooth skin and may contain such natural substances as estrogens, which are found in youthful skins but are deficient in the skins of older persons. Lotions of an astringent type are intended to give an invigorating feeling. Preparations such as cleansing grains are designed to loosen impurities in the pores. Softening agents such as body and hand creams are widely used. See Skin.

Make-up preparations are available in dozens of shades in each type of make-up. (See Make-up.) Lipstick is probably the most widely used. Face powder is made in both loose and compact form, and different formulations are made for various skin types. Foundations and rouges are available in cream, liquid, and cake form. For the eyes there are eye shadows, eyebrow pencils to be applied to brows and along the eyelash line, and waterproof or plain mascaras in both cream and cake form. Nail polishes, which are used extensively, have become more variously colored, quicker drying, and longer lasting.

Hair cosmetics may be of a treatment, chemical, or color type. Permanents to be applied in the home grew rapidly in popularity with the invention of the machineless and cold waves. Prior to this development permanents had to be administered by trained operators who understood the timing and safety devices on complicated machines. Home permanents carry varying instructions for particular hair types and desired effects. Coloring of hair in the home has also become widespread. These colors may be temporary, such as in rinses used after shampoos, in grooming aids, or in hair sticks used to touch up the hair. Permanent changes in hair color are accomplished by bleaching the hair or by dyeing (the addition of color). Shampoos for cleansing hair contain soaps or the chemical detergents developed in recent years. Conditioning aids help to overcome oiliness, dryness, and brittleness. Grooming aids such as hair sprays have been developed to keep the hair neat and in place. See Hairdressing.

Fragrances have been made more lasting, subtle and brilliant with the aid of chemical research. Perfume, the most concentrated fragrance, is only one of its many forms; bath oils, talcums, solid colognes, and toilet waters all use diluted variations of perfume. See Perfume.

Specialties include such cosmetic preparations as hair removers, deodorants, and sunburn oils. Depilatories are chemical hair removers, epilatories are wax-like substances which enmesh hair, and abrasives rub the hair off. Deodorants remove odor from perspiration, but antiperspirants contain astringents which temporarily deflect the flow of perspiration. Preparations to check sunburn (creams, oils, liquids, or sprays) are designed to screen out ultraviolet rays of the sun. Different kinds of skin tan may be acquired, depending upon the kinds of preparations used.

Certain mechanical procedures, including plastic surgery, may be considered as cosmetics although the benefits are often medical as well. Exercise is helpful and can be general or specific. Massage, both body and facial, improves muscular tone. The care of the teeth, including brushing, orthodontia, bridgework, and capping, enhances appearance as well as contributing to good health. Plastic surgery, besides enhancing beauty and correcting physical deformities, contributes to emotional well-being (see Plastic Surgery). Dermatologists are continuing work in the field of cosmetics for the treatment of stubborn acne conditions, whiteheads, and scars by a new process known as planing. Helena Rubinstein

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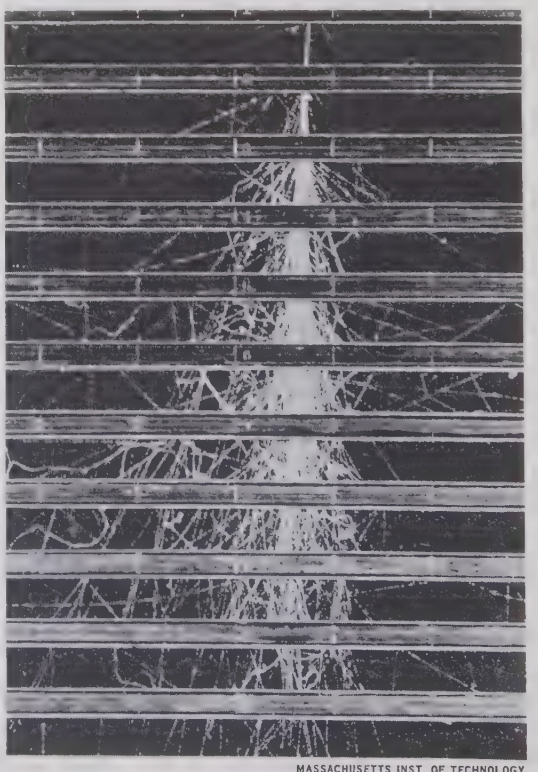
COSMETIC SURGERY. See Plastic Surgery.

COSMIC RAY, any highly penetrating atomic particle that has its origin in our sun and outer space. These particles bombard the earth from all directions with the intensity greatest at the Equator and smallest at the poles. Since the end of the eighteenth century it had been known that an electroscope slowly loses its electric charge despite all precautions that may be taken to avoid leaks through the insulators (see Electrostatics). At the beginning of the twentieth century several physicists began to investigate this effect. Radioactivity had just been discovered, and it was known that rays from radioactive substances split the molecules in the air into positive and nega-

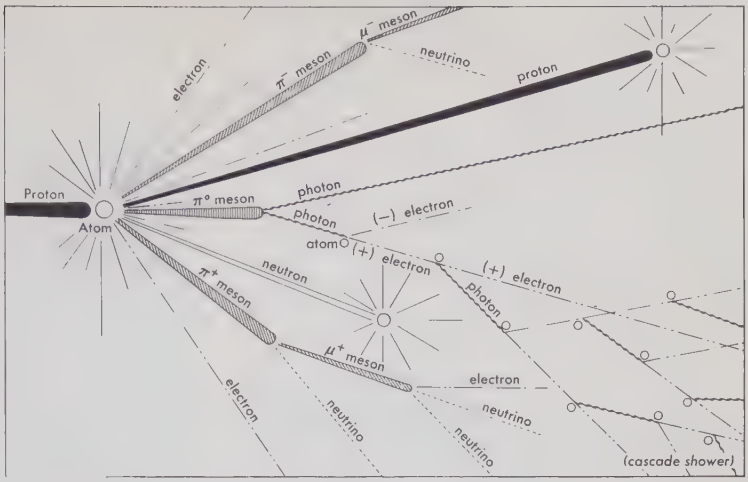


MASSACHUSETTS INST. OF TECHNOLOGY

This cloud chamber photo of a cosmic ray group shows how rays have bombarded and penetrated strips of half-inch brass, causing a cosmic ray "shower," captured on film.

tive charged ions (see ION) and that such ionized air conducts electricity. It was natural to think that the persistent slow leak of the electroscope might be due to a slight ionization of the air by traces of radioactive substances contained in the earth's crust. To test this assumption, Theodore Wulff in 1910 took an electroscope to the top of the Eiffel Tower in Paris. He expected to observe there a slower rate of discharge because the radiation responsible for the discharge of the electroscope, if it actually came from the earth's crust, should have been weakened by the passage through air. Wulff's experiment showed no appreciable difference in the discharge of the electroscope and thus cast serious doubt on the assumption that the ionized air resulted from radioactive substances on the earth.

In 1910 Hess (see HESS, VICTOR FRANCIS) rose in a free balloon to the altitude of 17,000 feet, and there found that the electroscope lost its electrical charge twice as fast as it did at sea level. Thus the mysterious radiation not only did not decrease, but actually increased in intensity with increasing altitude. On the basis of his observations Hess put forward the hypothesis that this radiation comes from outside the earth's atmosphere and is gradually attenuated as it traverses the atmosphere. Hess' daring hypothesis was not accepted until other explanations had been tested and discarded. In particular it was necessary to ascertain whether the radiation could possibly originate from radioactive gases in the atmosphere, but experiments disproved this theory. In 1927 Millikan (see MILLIKAN, ROBERT ANDREW) introduced into science the name cosmic rays for this type of high-energy radiation.



As a primary cosmic ray enters the earth's atmosphere, at the left, it collides with an atom. From this primary disintegration a number of secondary cosmic ray particles are ejected at high speeds. Some particles will travel uninterruptedly until they reach the earth or collide with another atom. Other particles will spontaneously decay into simpler particles. A process of materialization occurs when a photon enters the vicinity of an atom's magnetic field, is slowed down, and converted into two electrons. When these electrons pass near another atom a process of radiation occurs and the electrons emit another photon. This chain reaction produces one of the many cascade showers which bombard the earth. This diagram illustrates only well known secondary particles. Many other similar particles have been identified.

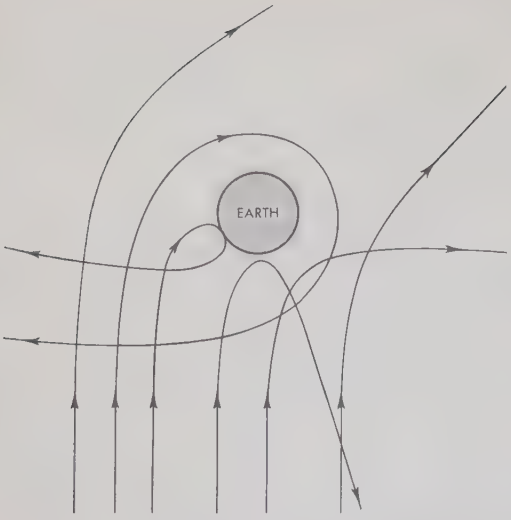
Once the outer space origin of cosmic rays had been firmly established, the question as to the nature of these rays began to receive increasing attention. It was necessary to determine if cosmic rays were similar to the known types of terrestrial radiation, or whether they were an entirely new phenomenon.

Because cosmic rays are similar to ordinary gamma rays (see GAMMA RAY) in their penetrating power, they were at first thought to be ultra-gamma rays with a shorter wave length and greater energy. But it was soon discovered that cosmic rays possess both electrical charge and mass, a property not found in gamma rays. The invention of the Geiger-Müller counter (see GEIGER-MÜLLER COUNTER) in 1928 gave the physicists an instrument particularly suited to the difficult experimental task of probing into the nature of the cosmic radiation. Unlike the electroscope, whose discharge is due to the cumulative effects of many rays, the Geiger counter is capable of detecting each ray individually. Moreover, the use of several Geiger counters affords the possibility of following the trajectories of cosmic rays through matter and investigating their behavior in some detail. About 1930 the cloud chamber (see CLOUD CHAMBER) was adapted to the study of cosmic rays and more recently photographic emulsion was developed into a powerful tool of cosmic ray research. In the cloud chamber the trajectories of cosmic ray particles are made visible through the condensation of water vapor on minute ionized particles The trajectory appears as a white streak in a thin fog. In the specially prepared photographic emulsion the particle will expose the part of the emulsion that corresponds to its path.

Nature of Rays. The results of the intensive research, which began around 1930, has yielded valuable information on these mysterious, powerful rays. The cosmic radiation was found to contain all kinds of previously known rays, such as gamma-rays, X rays, and high-speed electrons (see X RAY; ELECTRON), plus many rays that had never been observed before. For the most part these new rays are waves of high energy at speeds close to the velocity of light, and particles, created out of energy, at slower speeds. These particles decay into lighter particles after exceedingly short time intervals. For example, a fast proton or neutron (see PROTON; NEUTRON) colliding with an atomic nucleus may produce a pi-meson. This particle has a mass equal to 273 electron masses and decays into a mu-meson and a neutrino (see MESON; NEUTRINO) with a mean life of 2.5 hundredths of a microsecond (one microsecond is one millionth of a second). The neutrino is a particle of zero mass containing only energy. The mu-meson has a mass of 206 electron masses, lives on the average 2.2 microseconds, and then decays into one electron and two neutrinos.

Cosmic ray experiments not only brought to light an unsuspected wealth of new particles (see Table 1), but also revealed the existence of particles possessing almost unbelievable energies. Rays from radioactive sources have energies of the order of millions of electron volts (see ELECTRON VOLT). With modern techniques it has been possible to accelerate particles to energies of several billion electron volts, or several Bev. Among cosmic rays, particles with 10 or 100 Bev are common and particles with energies as high as 1 billion Bev are occasionally observed (100 billion electron volts would contain enough energy to raise the temperature of 1 gram of water .000000004°C).

Directly related to the enormous atomic energies of cosmic ray particles is their ability to produce large showers. A cosmic ray shower results from a chain of interactions whereby the energy originally concentrated in one particle becomes subdivided among a large number of secondary particles. It has been estimated that a man's body is riddled more than



The effects of the earth's magnetic field on the paths of the primary cosmic rays are shown in this diagram which is viewed as though from a point high above the North Pole.

20 times a second by these showers, causing additional showers in his bones and tissue.

In the course of cosmic ray experiments it soon became apparent that the radiation observed at sea level or even at the mountain stations was not to be confused with the primary radiation that strikes the earth's atmosphere from outer space. In fact, the majority of the rays found in the atmosphere are secondary rays, generated in the collisions of the primary rays with atoms of oxygen and nitrogen in the layer of air above the place of observation. Nevertheless, physicists were able to discover many important properties of the primary radiation at sea level by observing the effects of the earth's magnetic field on the many types of cosmic ray particles. This field is not very strong, the effect of an ordinary magnetic field on a compass needle being 10,000 times as strong as the earth's magnetic field. However, the field's large extent makes up for its comparative weakness. Since the earth's magnetic field extends to distances considerably greater than the effective thickness of the atmosphere, it acts upon primary cosmic radiation before collisions with atoms change its identity. Therefore the earth's magnetic field provides a gigantic natural scientific instrument by which physicists can analyze primary cosmic rays.

A magnetic field does not affect the direction of neutral rays, such as gamma-rays or neutrons, but it bends the path of charged particles, such as protons or electrons, in one or the other direction, depending on the sign of their charge. A charged particle of comparatively low energy approaching the earth is rejected by the earth's magnetic field back into space. Particles of higher energy can reach the earth, although in a direction different from their original direction of arrival. One can prove that the "magnetic barrier" is most effective near the Equator and becomes gradually weaker with increasing latitude. Hence, if primary cosmic rays are electrically-charged particles, both the number of the primary particles striking the top of the atmosphere and the number of the secondary particles detected by an instrument within the atmosphere should be greater at high latitudes than near the Equator. Such an effect, called latitude effect, was actually observed and provided the first indication that primary cosmic rays are, at least in part, electrically charged. The theory also shows that positive particles are deflected in such a way as to arrive preferentially from the western directions, whereas negative particles are deflected in such a way as to arrive preferentially from the eastern directions. Actual measurements of this east-west effect showed that the cosmic ray intensity is greater in western than in eastern directions, and led to the conclusion that primary cosmic rays are, for the most part at least, positively charged.

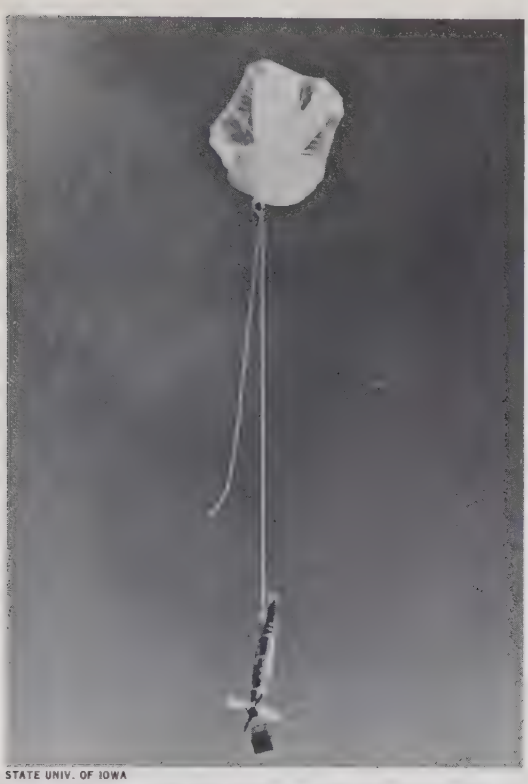
In order to obtain more detailed information on the nature of the primary radiation, it was necessary to make a direct and extensive study of this radiation at high altitude before it became contaminated with secondary rays. Unmanned balloons, reaching altitudes of the order of 100,000 feet, and rockets, reaching altitudes of the order of 300,000 feet, were used in this investigation. The detectors were photographic emulsions, counters, and cloud chambers. The data obtained by these methods showed that primary cosmic rays consist entirely of bare nuclei of the various elements. Among them, nuclei of hydrogen (protons) are by far the most abundant. Next in abundance are nuclei of helium, or alpha particles (see ATOM). Nuclei observed in the primary cosmic radiation and their relative abundances appear in Table 2.

Table 1. Elementary Particles

FAMILY	NAME	SYMBOL	MASS (electron masses)	MEAN LIFE (seconds)	DECAY SCHEME
	Photon	γ	0	stable	
	Neutrino	ν	0	stable	
	Negative electron	e^-	1	stable	
	Positive electron	e^+	1	stable	
Light Mesons	Positive mu-meson	μ^+	206	2.2×10^{-6}	$\mu^+\rightarrow e^+ + \nu + \nu$
	Negative mu-meson	μ^-	206	2.2×10^{-6}	$\mu^-\rightarrow e^- + \nu + \nu$
	Positive pi-meson	π^+	273	2.5×10^{-8}	$\pi^+\rightarrow \mu^+ + \nu$
	Negative pi-meson	π^-	273	2.5×10^{-8}	$\pi^-\rightarrow \mu^- + \nu$
	Neutral pi-meson	π°	264	$\leq 5\times10^{-15}$	$\pi^\circ\rightarrow \gamma + \gamma$
	Positive tau-meson	τ^+	965	10^{-8}	$\tau^+\rightarrow \pi^+ + \pi^+ + \pi^-$
	Negative tau-meson	τ^-	965	10^{-8}	$\tau^-\rightarrow \pi^- + \pi^- + \pi^+$
	*Neutral tau-meson	τ°	$\sim$965	?	$^*\tau^\circ\rightarrow \pi^+ + \pi^- + \pi^\circ$
	Positive chi-meson	χ^+	965	10^{-8}	$\chi^+\rightarrow \pi^+ + \pi^\circ$
	Negative chi-meson	χ^-	965	10^{-8}	$\chi^-\rightarrow \pi^- + \pi^\circ$
Heavy Mesons	Theta-meson or neutral chi-meson	θ°	965	1.5×10^{-10}	$\theta^\circ\rightarrow \pi^+ + \pi^-$
	Positive $K_{\mu 2}$-meson	$K_{\mu 2}^+$	965	10^{-8}	$K_{\mu 2}^+\rightarrow \mu^+ + \nu$
	*Negative $K_{\mu 2}$-meson	$K_{\mu 2}^-$	965	10^{-8}	$^*K_{\mu 2}^-\rightarrow \mu^- + \nu$
	Positive kappa-meson	K^+	$\sim$965	10^{-8}	$K^+\rightarrow \mu^+ + \pi^\circ + \nu$
	*Negative kappa-meson	K^-	$\sim$965	10^{-8}	$^*K^-\rightarrow \mu^- + \pi^\circ + \nu$
	Positive K_{e3}-meson	K_{e3}^+	$\sim$965	10^{-8}	$K_{e3}^+\rightarrow e^+ + \pi^\circ + \nu$
	*Negative K_{e3}-meson	K_{e3}^-	$\sim$965	10^{-8}	$^*K_{e3}^-\rightarrow e^- + \pi^\circ + \nu$
	Anomalous K°-meson	K°	?	?	$^*K^\circ\rightarrow \pi^\pm + \mu^\pm + \nu$
Nucleons	Proton	p	1836	stable	
	Antiproton	$\bar{p}$	1836	stable	
	Neutron	n	1838	1080	$n\rightarrow p + e^- + \nu$
Hyperons	Lambda-particle	Λ°	2181	3.7×10^{-10}	$\Lambda^\circ \nearrow p + \pi^-$ $\Lambda^\circ \searrow n + \pi^\circ$
	Positive sigma-particle	Σ^+	2327	$\sim10^{-10}$	$\Sigma^+ \nearrow p + \pi^\circ$ $\Sigma^+ \searrow n + \pi^+$
	Negative sigma-particle	Σ^-	2327	$\sim10^{-10}$	$\Sigma^-\rightarrow n + \pi^-$
	*Neutral sigma-particle	Σ°	$\sim$2327	$\ll10^{-10}$	$^*\Sigma^\circ\rightarrow \Lambda^\circ + \gamma$
	Negative cascade particle	Ξ^-	2583	$\sim10^{-10}$	$\Xi^-\rightarrow \Lambda^\circ + \pi^-$

*Doubtful particles or decay processes

COSMIC RAYS



STATE UNIV. OF IOWA

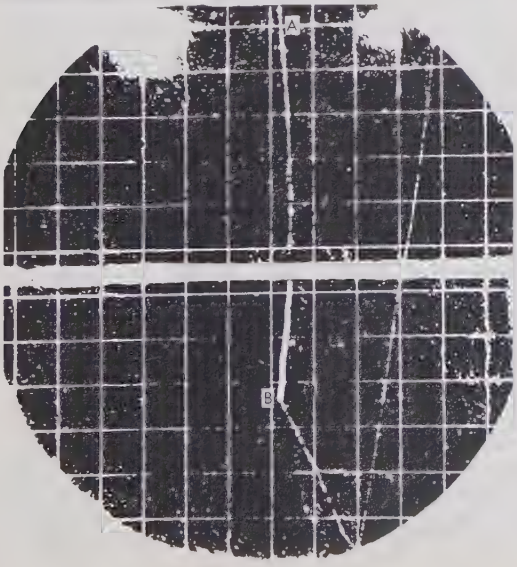
This balloon-launched rocket, ascending to firing altitude off the west coast of Greenland, is carrying cosmic ray equipment used for the study of primary cosmic radiation.

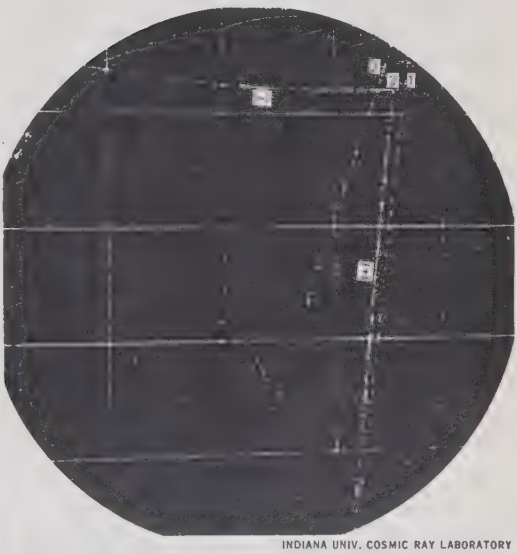
UNIV. OF CHICAGO

At the University of Chicago, where extensive cosmic ray research has been conducted, a balloon is launched with equipment aboard to measure cosmic ray intensity aloft.

In this cloud chamber picture of negative mu-meson decay, the mu-meson entered the cloud chamber from above, at *A*, slowed down in traversing an aluminum plate, and then decayed into a negative electron and two neutrinos at *B*.

MASSACHUSETTS INST. OF TECHNOLOGY





INDIANA UNIV. COSMIC RAY LABORATORY

This photograph shows the decay of a lambda-particle, and the tracks of two charged particles, *1* and *2*, produced in a lead chamber placed above the cloud chamber. The lambda-particle decays, at *3*, into positive and negative particles. Both particles in this photo had low velocity and it was possible to estimate the fragment masses. The positive fragment was found to have a mass near that of the ordinary proton, and the negative fragment a mass near that of the pi-meson. This photograph was one of the first examples of normal lambda decay in which $\Lambda^{\circ} \rightarrow p + \pi^{-}$.

Table 2

Nuclei	Per cent of total number of particles
H (protons)	91.7
He (α-particles)	7.6
Li, Be, B	0.13 (?)
C, N, O, F	0.35
Atomic No. >10	0.22

Not only is the nature of the primary cosmic radiation well established, but the process by which the primary radiation produces the various secondary rays which are observed in the atmosphere is also clearly understood. The following is a typical sequence of events. The primary particle, for example, a proton of 20 billion electron volts energy, undergoes its first collision with an atomic nucleus at an altitude of about 10 miles above sea level. In this collision several high-energy secondary particles are produced. These secondary particles include protons, neutrons, positive and negative pi-mesons (π), and neutral π-mesons. The secondary protons and neutrons travel in the atmosphere until they collide with other atomic nuclei. Some of the charged π-mesons also collide with atomic nuclei, but most of them undergo spontaneous decay in flight, each producing one mu-meson (μ) and one neutrino (ν): $\pi^{\pm} \rightarrow \mu^{\pm} + \nu$. Neutrinos have been detected. Mu-mesons do not interact with atomic nuclei, and travel in the atmosphere until they bury themselves underground, or until they decay into electrons (e) and neutrinos: $\mu^{\pm} \rightarrow e^{\pm} + \nu + \nu$.

The neutral π-mesons (π^0) decay immediately, each of them producing two photons (γ): $\pi^0 \rightarrow \gamma + \gamma$. Photons, traversing the strong electric fields found in the neighborhood of atomic nuclei, undergo a process of materialization, each producing a pair of positive and negative electrons: $\gamma \rightarrow e^+ + e^-$. Electrons, passing near atomic nuclei, undergo a radiation process, producing more photons: $e^+ \rightarrow e^+ + \gamma$. Thus gradually all the various components of the radiation observed in the atmosphere are built up.

Particularly interesting are the secondary phenomena occurring when the primary energy is very large, say of the order of one million Bev or more. Then the total number of secondary particles produced by a single primary particle is also very large (about 100,000 for a primary energy of 1 million Bev and about 100 million for a primary energy of 600 million Bev). All of these particles arrive at sea level simultaneously, covering an area of many acres. Phenomena of this kind are known as giant air showers.

Origin. Of the remaining problems, the most important one concerns the origin of cosmic rays. The simultaneous occurrence of increased cosmic ray showers on the earth, with disturbances on the sun (see SUNSPOTS), indicates that some primary cosmic rays have their origin in high-frequency electromagnetic radiation (see ELECTROMAGNETIC WAVES) emitted by the sun. It is believed that the rest come from sources other than the sun but within the boundaries of our galaxy. It is also believed that cosmic rays do not escape freely from our galaxy but are trapped within the galactic volume for periods of the order of one or several million years. Magnetic fields, bending the paths of cosmic ray particles into complicated trajectories, are thought to be responsible for the trapping. The temporary trapping of the cosmic radiation enhances its intensity and also accounts for the fact that cosmic rays appear to arrive in nearly equal numbers from all regions of the sky.

The mechanism by which cosmic ray particles acquire their extraordinarily high energies is not completely known. Some theories ascribe the production of cosmic rays to phenomena occurring in stars or in the immediate vicinity of stars. According to these theories cosmic rays are accelerated to their full energy within short periods of time, and then travel through the galaxy for one million years or so without appreciable change of energy. One hypothesis that has received considerable attention is that which links the origin of cosmic rays to the violent explosions known as supernovae (see NOVA), that occur at the rate of about one every hundred or several hundred years in our galaxy. Because of the long storage time of cosmic rays in the galaxy, an intermittent source would be compatible with a practically constant intensity. According to another school of thought, cosmic rays are injected into space as particles of moderate energies and are then gradually accelerated during their motion through galactic space. Collisions of cosmic ray particles with wandering magnetized clouds of hydrogen may provide the required acceleration mechanism. See NUCLEAR PHYSICS.

BRUNO ROSSI

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COSMOLOGY AND COSMOGONY. Cosmology, from *cosmo* (universe or order) and *-logy* (study of), is the study of the physical universe considered as a whole, together with the laws and relationships that govern its orderly behavior. Cosmology is often confused with cosmogony, from *cosmos* and *gignomai* (the coming-to-be), which is the study of the origin of the physical universe, or sometimes of the origin of order in the heavens and the world. The two studies can be, and have been, approached in three ways—poetically, philosophically, and scientifically.

Cosmogony was originally poetic. Subsequent philosophical analysis, and often repudiation of poetic accounts led to descriptions of the world order as discovered by what was thought to be pure reason. Such cosmological descriptions differ from cosmogony in that their starting point is the world as it is now (insofar as reason can tell) rather than speculation on its possible origin; and their method is analytical and rational, rather than poetic. Science later insisted upon a closer examination of the starting point of cosmology, saying that the investigation should not start with what men think the world is, but rather with what careful and methodical (scientific) observation reveals it to be in fact. One of the first problems science treated when it took up the question of the constitution of the cosmos was the problem of the origin of the world, that is, cosmogony. The close relationship between cosmology and cosmogony makes it necessary to define terms carefully in discussing them. Cosmogony can mean either primitive (never critical and often inconsistent) poetry or myths about the origin of the world, or the science of the origin of the world under the influence of empirically discovered natural laws. Cosmology also has a double meaning—philosophical speculation on the nature of the world conducted without regard to systematic observation; or critical analysis of the data and results of the scientific study of the world, including an evaluation of the assumptions, concepts, and criteria of science.

A. N. Whitehead, a leader among these critical cosmologists, maintained in *Process and Reality* (1929) that philosophy must refuse to accept any merely partial formulation as the whole truth. Science, for example, distinguishes the spatio-temporal world from the mental or spiritual. But science's concentration on the former often seems to imply that the latter is not real. The study of cosmology, said Whitehead, must determine the degree of reality that should be ascribed to each realm, and must investigate the possibility of reducing the two worlds to one by means of a "unified theory."

Early Cosmogony. Primitive cosmogonies were mythologies which arose, seemingly, because man could not accept existence as self-explanatory; some preternatural agent had to be posited as having brought it about. In almost all primitive cosmogonies the agent of creation forms the universe from previously existing chaotic matter (rather than by an act

of creation from nothing). Most of them consider this to have been done within a relatively short span of time (rather than through a lengthy evolution). The cosmogony of India was the most speculative: the self-existent Lord thinks, and his thought bursts forth into reality in form of the "waters" and a "seed" which later becomes the egg from which is born Brahma, the father of the world. The Egyptians spoke of a pre-existent flood which they thought contained the seed of all things which were, in turn, called forth by a god variously called Khnumu, Thoth, or Ptah. The Israelite account in the book of Genesis is probably the most familiar, but the Greek myth of Uranus and his sons and grandsons is richest in imaginative content. See MYTHOLOGY.

Beginnings of Cosmology. The Greek Thales (600 B.C.) challenged mythology's anthropomorphism and posited water as the essence of all things (see THALES). This was the beginning of cosmology. Plato expressed the relationship between this imperfect world and the world of perfect Ideas by having the world-forming god, Demiurge, fashion this world out of nonbeing or space, making it as similar to the Ideas as the intrinsic limitations of matter would allow (see DEMIURGE; PLATO). Aristotle's theory made the world eternal but had it receive its form from its movement toward the "unmoved mover," which attracts all teleologically (see ARISTOTLE; TELEOLOGY). Plato's theory, modified by the Christian concept of creation, was dominant until the thirteenth century, when St. Thomas Aquinas made Aristotle popular.

Galileo early in the seventeenth century upset a well-entrenched Aristotelianism by disproving experimentally the concept of a stationary earth as the center of cosmos. In this he supported Copernicus' heliocentric theory and was aided by the work of Brahe and Kepler (see BRAHE, TYCHO; COPERNICUS; GALILEO; KEPLER, JOHANN). Descartes, meanwhile, posited all space as filled with matter set in motion by God; the resultant collisions forced the motion into a circular path and wore matter down into smaller bits at the vortex, leaving larger parts at the outside: the center became the sun, the bits and pieces outside became the planets (see DESCARTES, RENÉ). Newton, in *Mathematical Principles of Natural Philosophy* (1687), saw the universe as a vast "machine" controlled throughout by the same mathematically describable laws that a scientist can observe operating in experiments (see NEWTON, ISAAC). Following Newton, Immanuel Kant theorized in 1755 that "gravity" brought chaotic primordial matter together, bombarding the center of the cosmos; the resultant heat and rotation of the sun threw off blobs that later became the planets (see KANT, IMMANUEL). Forty-one years later, Pierre Laplace, using Newtonian science, developed Kant's notion into the first systematic and truly scientific cosmogony, the so-called "nebular hypothesis," which remained popular almost to the beginning of the twentieth century (see LAPLACE, PIERRE; NEBULAR HYPOTHESIS).

E. B. COSTELLO

Later Theories. The statement of Kant, "Give me matter and I will construct a world of it," expressed the universal nature of matter. Laplace contributed greatly to mathematical science and astronomy by showing how it was mathematically possible for our solar system to have developed from condensations of gaseous envelopes around the sun.

With the improvement of the telescope by Herschel, 1782 (see HERSCHEL, SIR JOHN), and the development of the technique of spectroscopy in 1817 (see SPECTRUM), it became possible for Great Britain's Lord Kelvin (see KELVIN, WILLIAM THOMPSON) to predict the temperature of the stars and the age of the earth. Meanwhile, Jeans and Eddington (see JEANS, SIR JAMES; EDDINGTON, ARTHUR STANLEY) provided information on the density and mode of radiation of heavenly bodies. George Gamow and Carl von Weizsäcker determined that the composition of the sun and stars is essentially a mixture of hydrogen and helium. Although these men, together with others, contributed importantly to modern cosmology, Einstein's theory of relativity (see RELATIVITY) was the greatest single force in shifting cosmological problems from poetry and speculative philosophy to physics. The introduction of such concepts as the fourth dimension, the constancy of light, the curvature of space, and the finite universe constituted a revolution in scientific thought. While the theory of relativity shaped the concept of the universe, the quantum theory (see QUANTUM THEORY) shaped the concept of the atom. Einstein's unified field theory was an attempt to provide a bridge between the two, and through this an explanation of the cosmos. See ASTRONOMY; CREATION; PLANETESIMAL HYPOTHESIS; UNIVERSE.

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COSMOS, a genus of annual and perennial herbs belonging to the family *Compositae*. There are some 20 species, all of which are native to tropical America. A few annuals, of which *C. bipinnatus* is typical, are cultivated as garden flowers. This species grows to a height of 7 to 10 feet, and has smooth stems and pinnately cut leaves. Its flowers may be rose, crimson, or white. A sandy soil, not too rich, produces the best flowers and it is generally well to sow seeds indoors in April and transplant when danger of frost is past.

USDA

Cosmos in Bloom

COSPICUA, also Bormla, town, E Malta, on Grand Harbor, 1½ miles S of Valletta. Cospicua, Vittoriosa, and Senglea comprise the "Three Cities" of Malta. The town of Cospicua is important as a naval base, and has extensive ship repairing facilities and a naval arsenal. Much of the town was destroyed by air raids during World War II but a few historic buildings have survived. These include the ancient Galley Houses of the Knights of Malta together with some ecclesiastical buildings. Pop. about 5000.

COSSA, FRANCESCO DEL, 1438?–?80, Italian painter, was born in Ferrara, where he painted under the patronage of the Duc d' Este until about 1470. After completing a series of frescoes (which had been started by his friend Cosimo Tura) in the Schifanoia Palace, Francesco moved to Bologna, reputedly because he was angry at the small payment received from his patron. In Bologna, under the patronage of the Bentivoglio family, Francesco produced his most important works, among them the Grifoni Chapel altarpiece. Depicting a series of episodes in the life of St. Vincent Ferrer, this altarpiece established the style which came to be considered typical of the Bolognese school. Mannered elegance and simple, almost abstract, composition were the school's salient characteristics, and its influence on later northern Italian schools was notable.

COSSACK, one of a military group in southern and eastern Russia, which for centuries provided frontier protection and special mounted troops in the

service of the czars. The name is from a Turco-Tartar word meaning rider or rover.

Cossacks first appeared in the fifteenth century in the region stretching from the outposts of Muscovy southward to the Black Sea, and from the Polish borders eastward to the Caucasian foothills. Runaway serfs, escaped convicts, army deserters, adventurers, and freedom-seekers of many kinds banded together to build their *stanitsas* or villages in these steppes; to hold their self-governing meetings; to elect their *hetmany* and *atamany* (headmen); and to form with other settlements an armed state or *voisko* (literally: host), called after its main river. The Don host was the largest and strongest. The Dnepr (Dnieper) host was commonly named from that river's rapids—Zaporog, or Beyond-the-Rapids.

Established on the frontier and practically independent, the Cossacks raided their neighbors the Tartars, Turks, Muscovite Russians, and Poles. With the supremacy of Moscow, and the expansion of its rule, the Cossacks were gradually subjugated in the seventeenth and eighteenth centuries, but only after alliances first with Poland and then with Russia in the middle of the seventeenth century, and after a series of revolts. Stenka Razin led the seventeenth century uprising, and became a folk hero. (See Razin, Stenka.) Mazeppa led the Cossacks in the Ukraine into alliance with Sweden against Peter the Great early in the eighteenth century (see Mazeppa, Ivan Stephanovich). Later in the century Cossacks followed Yemelyan Pugachev in his revolt. The Dnepr, or Zaporog, Cossacks were the last to be subdued, in 1775.

The Cossacks served the czars and Russian expansion by pushing forward into Siberia. Under Yermak Timofeyitch in the late sixteenth century they moved into the territories of the Khan of Kuchum and, in the next century, still farther east. (See Siberia, Government and History, *History.*) Before the 1917 revolution Cossack troops, as part of the Czarist armies, were known for their work in suppressing rebellion, including the 1905 uprising. During the Bolshevik revolution and the ensuing civil war many Cossacks fought in the White Russian armies, but the minority joined the Soviet forces. Many were killed, many fled abroad, and those who remained were out of favor with the Communist government for nearly 20 years. In World War II only a small minority of the Cossacks joined the quisling army of Gen. Andrei Vlasov; most of them, under Marshal Semyon Budenny, served with the Soviet armies. See Russia, History, *Alexei and Successors*, *Catherine the Great.*

COSSACKS REGION, DON. See Rostov Region.

COSSIMBAZAR, also Kasimbazar, village, India, E West Bengal, near the Bhagirathi River, and 2 miles NE of Berhampur. From about 1658, Cossimbazar was a major English trading center, but declined, and by the nineteenth century was largely in ruins. The French had a trading post there in the eighteenth century and retained their rights until 1947.

COST. See Economics; Marginal Cost; Price; Production, Cost of; Value.

COSTA, LORENZO, 1460–1535, Italian painter known as the Perugino of Ferrara, was born in Ferrara, where he studied with Cosimo Tura. While still a young man he moved to Bologna where, with his pupil Francia, he decorated the chapel of St. Cecilia. An allegorical composition showing the Gonzaga court is in the Louvre, Paris, while his *Madonna and Child with the Bentivoglio Family* and several other altarpieces are in Bologna. An excellent colorist, he excelled in landscape backgrounds and architectural details: his figure groupings are noted for their simplicity of form and strongly-knit, almost abstract composition.

COST ACCOUNTING is a method of recording costs and of determining unit costs of producing each product or service. It may also be used to determine unit selling costs. Cost accounting is a specialized branch of accounting, and cost accountants have their own professional organization. See Accounting.

Uses of Cost Information. A knowledge of unit costs is important in making many kinds of business decisions. Alternative courses may be based upon unit cost information, such as in the following typical problems: the determination of the selling price of a particular product; the advisability of installing a new machine in a plant; the relative advantages in manufacturing a particular item or purchasing it on the market; the determination of the most efficient method of manufacturing an item; and the improvement of efficiency in operations. See Industrial Organization and Management.

Types of Cost Systems. In general the unit costs used in decision making are determined by prorating or allocating total costs to units of production on some basis. The most common costing bases used in manufacturing concerns are allocation of costs by lots of final product and by various manufacturing operations. The selection of a costing basis for a particular firm depends upon the type of information desired and the nature of the manufacturing process. For example, a builder of houses of various designs will probably allocate construction costs individually to the houses being built. This type of cost accounting system, in which a unit or lot of final product is used as a costing point, is known as a job lot or job order cost system. It is used most frequently in businesses which produce products made to customer specifications or in which one unit or lot of final product can be easily distinguished from another.

In other types of businesses, units of final product are so much alike that it is difficult to identify particular units. This is especially true in a flow type of production such as in the manufacture of cement; limestone and other materials proceed continuously from one operation to another and produce a continuous flow of cement. In such a case production costs are allocated to the various manufacturing operations. Unit cost for each operation is determined by dividing allocated costs by the number of units passing through a given operation. Total unit costs are determined by totaling the unit costs of various operations. This method is known as process cost.

These two cost systems have been classified according to the method of allocating costs. In addition cost systems can be classified into historical and predetermined cost systems. If the job order or process system is based upon historical costs, only actual costs incurred are recorded. However, it may be desirable to compare actual costs with earlier estimates of the costs. In such cases estimates or standard costs are established in advance of production and these costs, as well as actual costs, are recorded in the accounts. Differences between actual and standard costs are set out in such a way as to suggest the possible causes of these differences. For example, differences between actual and standard cost of materials may appear in "material price variance" and "material quantity variance" accounts. Such a system is especially useful in measuring efficiency of operations.

Nature of Manufacturing Costs. Regardless of the type of cost system, production costs can be categorized as material, labor, and burden (overhead). In referring to material and labor costs, the cost accountant means only those material and labor costs that can be readily identified with a lot of product or a particular operation. Other material and labor costs are combined with all other production costs and are known as burden, factory expense, or manufacturing overhead. For example, the builder of houses would classify the cost of bricks as material cost and bricklayers' wages as labor cost since these costs are easily related to particular houses. On the other hand, the salary of the foreman who supervises the construction of several houses would be included with such items as office rent and would be known

as burden. Since these latter costs can not be identified with particular jobs, they must be allocated to all jobs on some reasonable basis. Frequently labor hours or labor costs are used as the basis for distributing burden costs to the various jobs. See BOOKKEEPING.

F. VIRGIL BOYD

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COSTAIN, THOMAS BERTRAM, 1885– , Canadian writer, was born in Brantford, Ont. He was editor of *MacLean's Magazine* in Toronto, 1910–1920; later he went to the United States and was an associate editor of the *Saturday Evening Post* until 1934, when he started writing for motion pictures in Hollywood. Costain's historical novels, which began to appear in 1942 and were produced in rapid succession thereafter, were usually best sellers. Among them are *The Black Rose* (1945), *The Moneyman* (1947), and *The Silver Chalice* (1952). *The Conquerors* (1949), and *The Magnificent Century* (1951) were the first sections of a projected 12-volume *Pageant of England*, a popular history.

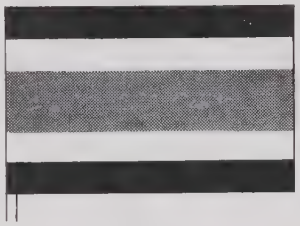
COSTA MESA, city, S California, in Orange County, near Newport Beach, 34 miles SE of Los Angeles. Costa Mesa is the commercial center for a farming, citrus-growing, and dairying region. Industries include the manufacture of plastic and metal products. It was incorporated as a city in 1953. Pop. (1955 special census) 17,320.

COSTA RICA, republic, bounded by Nicaragua on the N, the Caribbean Sea on the NE, Panama on the SE, and the Pacific Ocean on the S and W; area 19,695 sq. mi.; pop. about 942,000. Occupying the midsection of Central America and with an area less than half that of New York State, Costa Rica possesses valuable resources and some of the finest scenery in the New World. Several distinctive features place Costa Rica in a special category among the Central American republics. The population is predominantly European in descent, enjoys a relatively high standard of living, and has well-established democratic institutions. Besides its territory in Central America, Costa Rica possesses Cocos Island, some 360 miles to the southwest of San José in the Pacific Ocean. See map in Vol. 20.

Topography. Costa Rica is largely a highland country with a mountain backbone that extends from northwest to southeast. From north to south the major ranges are the Cordillera de Guanacaste, the Cordillera Central, and the Cordillera de Talamanca. Chirripó (12,860 ft.) in the Cordillera de Talamanca and Irazú (11,260 ft.) in the Cordillera Central are the highest of several lofty volcanic peaks in the south-central portion of the country. Several inter-mountain basins occur in the highlands, notably the Meseta Central of central Costa Rica, forming an area of fertile volcanic soils with an average elevation of about 4000 feet. Another large basin occurs in the southern part of the country and is drained by the upper Diquís River. Lowlands mainly occur in the coastal regions. The most extensive coastal plains border the Caribbean Sea with the greatest width in the north. Much of the Caribbean lowland is marshy. Discontinuous coastal plains occur along the Pacific shore, principally around the Gulf of Nicoya.

Coat of Arms of Costa Rica

The Caribbean Coast of Costa Rica is generally low-lying, regular, and fringed with lagoons. The longer Pacific Coast is much more irregular, and includes two major promontories, the Nicoya and Osa peninsulas, and two major indentations, the Gulf of Nicoya and the Golfo Dulce.



The Costa Rican flag has deep blue stripes top and bottom, red center stripe, and white stripes between.

Great numbers of swiftly flowing rivers rise on the highlands of Costa Rica and have mostly eroded deep valleys. Major streams are the Tempisque, Grande, and Diquís, draining to the Pacific Ocean. On the Caribbean side are the San Juan, forming part of the Nicaragua-Costa Rica border; the San Carlos, major tributary of the San Juan; the Reventazón; and the Sixaola, which forms a section of the Panama-Costa Rica frontier.

Location Map of Costa Rica

Climate. Great climatic variations occur within the small extent of Costa Rica. Temperature ranges from tropical to cool temperate, depending on elevation. Three distinct vertical climate zones occur: the *tierra caliente* (hot country) below 1500 feet; the *tierra templada* (temperate country) from about 1500 to 5000 feet; and *tierra fría* (cold country) above 5000–6000 feet. None of the mountains are snow-covered at all seasons. The tropical Caribbean lowlands are the rainiest part of Costa Rica and have an average annual precipitation of more than 100 inches, in places exceeding 200 inches. Precipitation decreases toward the Pacific Ocean, the Pacific coastal plain generally receiving from 40 to 75 inches in an average year.

Natural Vegetation and Animals. Tropical rain forest covers the Caribbean lowland; the Pacific coastal region has semideciduous forests with large areas of grassland. The uplands vary from alpine meadows at the highest elevations to forests at lower levels. Animal life is rich and varied in Costa Rica, and includes the jaguar, puma, wild hog, tapir, deer, alligator, mountain goat, monkey, and rabbit, and other small animals.

Social Factors. The people of Costa Rica are largely European, particularly Spanish, in origin. About 15 per cent of the population is *mestizo* (mixed white and Indian), and some 5 per cent is Negro. Most of the Negroes live on the Caribbean lowlands. Approximately three-fourths of the total population

BLACK STAR

Shoeshine boys ply their trade along the mosaic walk to the Parque Central's music pavilion in San José, where frequent concerts are given. At the left is the cathedral.

is concentrated in the central highlands. Well-populated centers are San José, the capital, Limón, Puntarenas, Alajuela, Cartago, and Heredia. Spanish is the language of Costa Rica. Roman Catholicism is the state religion; religious freedom is guaranteed under the constitution.

About 80 per cent of the population of Costa Rica is literate, the highest proportion in Central America. The Common School Law of 1886 provided for free and compulsory elementary education between the ages of seven and 14. The elementary course covers six years, except for four- and five-year courses in rural areas. There are two types of secondary education, one providing three-year courses in commercial, agricultural, or technical studies, the other a five-year course leading to a baccalaureate examination. Higher education is provided by the University of Costa Rica (founded 1941) at San José, which includes schools of science, agronomy, economic and social sciences, law, pharmacy, engineering, dentistry, education, fine arts and letters, and philosophy. The Inter-American Institute of Agricultural Sciences at Turrialba is a teaching and research center maintained by the 21 American republics. There is also a National Conservatory of Music.

PRINCIPAL CITIES

	Population 1950 Census	Population 1952 Est.
San José, the capital	86,909	118,287
Limón	11,310	17,676
Puntarenas	13,272	17,056
Alajuela	13,903	14,887
Cartago	12,944	13,933
Heredia	11,967	13,115
Liberia	3,390	5,264

Agriculture. The majority of Costa Ricans are dependent on agriculture for their livelihood. Bananas, the most valuable export, are mainly grown on the Pacific coastal plains. Coffee has long been important in the economy of Costa Rica, the first area of coffee cultivation in Central America. It is estimated that one-fourth of the population is engaged in the production of the high quality, mild-type coffee, raised principally in the central highland region. Cacao is the third-ranking export crop, and is principally grown on the Caribbean lowlands. Other major crops are corn, rice, sugar cane, potatoes, beans, fruits (oranges, plantains, and avocados), tobacco, abacá, and cinchona. Livestock farming is generally important, particularly the raising of cattle, hogs, and chickens.

Forestry and Fisheries. About four-fifths of Costa Rica's area is woodland. Extensive forests occur on the lowlands and lower mountain slopes, and particularly luxuriant forests flourish on the Caribbean coastal plain. Cedar is the most important timber tree; others are mahogany, rosewood, sandalwood, guayacán, balsa, oak, dyewood, and medicinal varieties. The average annual output of lumber is about 3.1 million cubic feet, or 37.2 million board feet. Most of the lumbering is on the Pacific lowlands, and production is sufficient for domestic needs and some exports.

Costa Rica has an important fishing industry, mainly based on Pacific ports. Tuna is the most valuable commercial fish.

Mining. The mineral resources of the republic are believed to be considerable, but are little exploited. Gold is mined on the western mountain slopes, usually in small-scale workings. Other minerals include lead, silver, diatomite, magnetite, calcium carbonate, lime, manganese, sulfur, copper, nickel, zinc, iron, and coal.

Manufacturing and Commerce. Except for the processing of coffee and cacao most Costa Rican manufacturing is for home consumption. Leading manufacturing industries are the processing of agricultural produce, and the making of textiles, clothing, footwear, leather goods, beverages, soap, tobacco, pharmaceuticals, and furniture. The country is deficient in fuels but has abundant water power. Manufacturing is largely concentrated in the leading urban centers, particularly San José.

The import and export trade of Costa Rica is largely with the United States. Bananas, coffee, and cacao comprise Costa Rica's most valuable exports; machinery, chemicals, textiles, foodstuffs, metals, fertilizer, and petroleum are the major imports.

Communications. Costa Rica has only about 350 miles of highways and 500 miles of railroads. San José is linked by rail with Limón on the Caribbean and with Puntarenas on the Pacific. The Pan American Highway connecting Nicaragua with Panama, through Costa Rica, was scheduled for completion in the late 1950s. Major ports in Costa Rica are Limón, Puntarenas, Quepos, and Golfito. San José has the principal international airport of the republic, and there are air services between all the principal towns.

Government. The republican form of government in Costa Rica is headed by a president elected by direct vote for a four-year term. The president cannot immediately succeed himself. There are two vice-presidents, elected in the same manner as the president, and the cabinet normally consists of nine members. The legislative assembly is a unicameral body of 45 members. Deputies are elected by direct vote for four-year terms, with part of the assembly renewed every two years. The judiciary consists of a supreme court with 17 members, divided into four chambers. There are also four appeal courts and a court of cassation. A constitution adopted in 1949 guarantees liberty and contains certain social provisions. The constitution has the customary Latin American provision for the suspension of constitutional rule in an emergency. All men above the age of 20 (18 for married men and teachers) and women above the age of 21 have the vote under a system of proportional representation. The country is divided into seven provinces for administrative purposes.

POLITICAL DIVISIONS

PROVINCES	Area Sq. Miles	POPULATION Census 1950	POPULATION Estimate 1954
Alajuela	3,668	148,850	166,205
Cartago	1,004	100,725	112,912
Guanacaste	4,015	88,190	102,980
Heredia	1,120	51,760	57,169
Limón	3,629	41,360	46,487
Puntarenas	4,367	88,168	101,066
San José	1,892	281,822	311,510
Total	19,695	800,875	898,329

NATL. TOURIST BD. OF COSTA RICA

San José Banana Vendor

UNITED FRUIT CO.

Banana trees are sprayed at intervals to prevent leaf spot.

PAN-AMERICAN COFFEE BUREAU

Costa Rican Coffee Worker

PAN-AMERICAN COFFEE BUREAU

Coffee beans spread to dry in the sun are turned frequently.

NATL. TOURIST BD. OF COSTA RICA

Cowboy in Guanacaste

NATL. TOURIST BD. OF COSTA RICA

Cattle are driven from ranch corral to nearby pastures.

NATL. TOURIST BD. OF COSTA RICA

Young Oxcart Driver

BLACK STAR

Typical family "car" of Costa Rican farmer is colorful oxcart.

FREDERIC LEWIS

The elaborately decorated central post office in San José faces a quiet, shady street. Like many other government buildings, it was erected late in the nineteenth century.

One of Costa Rica's proud claims is that the country has more teachers than soldiers. The regular army was abolished in 1948 and replaced by a small civil guard.

History. The Caribbean section of what is now Costa Rica was visited by Christopher Columbus in 1502. Columbus himself is believed to have named the land Costa Rica, meaning "rich coast," presumably for promotional purposes. An unsuccessful Spanish settlement was founded on the Nicoya Peninsula in 1522 but hostile Indians forced its abandonment. The whole of Costa Rica was soon subdued by the Spaniards and the area became part of the captaincy general of Guatemala. In the 1560s Juan Vásquez de Coronado established Spanish settlements on the Meseta Central. Lacking suitably docile Indians to enslave, the Spaniards in Costa Rica established an agricultural society based on their own labor on small farms—a situation much different from that prevailing in most of the Spanish colonies of the New World. The Spanish population continued to be sparse throughout the seventeenth and eighteenth centuries but steady growth continued.

Independence from Spain was secured in 1821 and Costa Rica temporarily became part of Mexico. Between 1823 and 1838 Costa Rica was a member of the short-lived Central American Federation and afterward became a politically independent republic. In 1842 the country was the center of Francisco Morazán's futile effort to re-establish the Central American Federation. In 1857 William Walker, the American filibuster who had made himself dictator of Nicaragua, was frustrated in his attempt to extend his sway to Costa Rica (see WALKER, WILLIAM). President Juan Rafael Mora personally led Costa Ricans in the defeat of Walker's soldiers of fortune at Rivas. Mora also was responsible for stimulating the growth in Costa Rica of the coffee industry, which, during the latter part of the nineteenth century, became one of the major supports of the country's economy. Coffee was the leading export until 1949, when it was surpassed by bananas. Considerable foreign capital was invested in banana cultivation, which was begun by the United Fruit Company in the 1870s.

Notable during the twentieth century were the two-year dictatorship of Federico Tinoco, which was overthrown by revolution in 1919, and the reform government of Ricardo Jiménez Oreamuno, who, in three terms of office (last, 1932–36), secured progress for the nation. In 1940 Rafael Calderón was elected president and instituted a program of drastic social reforms. The 1944 election chose Teodoro Picado Michalski. Moderate political elements put forward a liberal, Otilio Ulate, for the presidency in 1948 and, despite obstruction by the Picado government, Ulate won a clear victory. However, Calderón and Picado elements succeeded in having the election declared void and Ulate was briefly imprisoned, an action that precipitated a violent revolution. The moderates were successful and Calderón and Picado, together with some Communist sympathizers, were exiled. A new constitution was declared in 1949, and Ulate assumed the presidency. President Ulate, who governed in a democratic manner, was legally succeeded in 1953 by José Figueres, a Socialist leader of the 1948 revolution. Figueres, supported by a new political party known as the National Liberation party, was the victor at the polls with a program calling for sweeping reforms and advocating some measure of government participation in industry. The Figueres regime was marked by bad relations with neighboring Nicaragua's dictator, President Anastasio Somoza.

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COSTELLO, JOHN ALOYSIUS, 1891– , Irish political leader, was born in Dublin. Costello practiced law in Dublin, was attorney general of the Irish Free State, 1926–32, and served in the Dail Eireann after 1932. He was prime minister of Eire, 1948–51, and returned to that office in 1954.

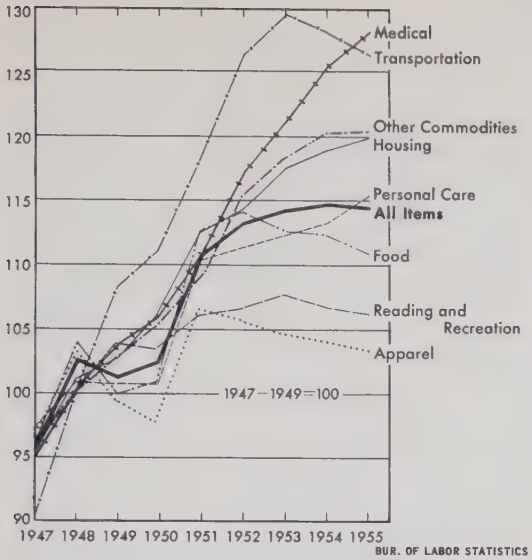
COSTER or **KOSTER, LAURENS JANSZOON,** 1370?–?1440, credited by Dutch scholars with the invention of printing with movable types, was born in Haarlem, Netherlands. The first claim that Coster had been a printer was made in 1550, and even though disputed, is still maintained in the Netherlands. See PRINTING.

COSTERMANSVILLE, province. See KIVU.

COSTERMANSVILLE, or Bukavu, town, E Belgian Congo, capital of the province of Kivu, on the S shore of Lake Kivu, 340 miles SE of Stanleyville. Costermansville is a commercial and communications center serving an agricultural region. It is located at an elevation of nearly 5000 feet in scenic mountain country. Its population includes many Europeans. Chief industries in Costermansville are the processing of agricultural produce, chemical manufacturing, tin ore processing, and printing. The town contains schools, hospitals, and government buildings. Pop. (1952 est.) 26,792.

COST OF LIVING, the money spent to purchase a given amount of goods and services in order to maintain a certain customary standard. Interest in the cost of living was heightened after World War I because of the compilation of statistical indexes of the cost of living by the U.S. Bureau of Labor Statistics (BLS). This consumer price index (C.P.I.) is published monthly, and is used primarily to deflate (adjust for consumer price changes) money incomes of wage earners in many industries, especially those covered by union contracts. Thus many wage contracts negotiated by management and labor unions contain clauses for automatic or negotiated adjustments of wages to reflect changes in the cost of living.

History. In periods of fluctuating prices, especially in times of inflation, the question of living costs becomes a public issue (see INFLATION). Since medieval times, when money wages began to be paid, periods of rising prices have evoked demands that wages should be increased to cover rising prices of consumer goods, or that prices should be controlled to enable workers to maintain their customary standards. When the price revolution in the sixteenth and seventeenth centuries in Europe caused wages to lag considerably behind rising prices (see PRICE), the Elizabethan Statute of Labourers provided that justices of the peace should set maximum wages in accordance with the price of "corn" (cereal grains) and this system was continued until the Industrial Revolution. The first field surveys to determine living costs were undertaken by F. M. Eden in England in 1795. Although independent investigation was started earlier, serious government research began with the



Cost of Living Trend, 1947–1955

BLS survey of household expenditures among 12,000 families of wage earners and clerical workers in shipbuilding and industrial centers in 1918–19, again largely as a result of wartime inflation. Using this information as a basis for "weighting" the relative importance of various items in family expenditures, the BLS began publication of a price index which it carried back to 1913 on the basis of available information. Regular compilation and publication of the index followed. During 1934–36, another survey was made in 42 cities to set up a new weighting basis to reflect changing spending habits among wage earners and clerical workers.

Use of the index to determine wage rates in the steel industry in 1942 focused public attention on the BLS index, and labor groups used it as a basis for justifying wage increases in negotiations and public announcements. At the same time union officials attacked the index as compiled during World War II on the ground that it failed to reflect adequately rapid changes in quality and availability, which they claimed raised costs higher than indicated by the index. Partly as a response to this criticism, the BLS in 1945 changed the name of its index from "cost of living index" to "consumer price index." After the war the index became even more important in wage issues as prices rose rapidly. The so-called escalator clause, providing automatic wage changes proportionate to changes in the index, was incorporated in wage contracts in the automobile industry in 1948. Other wage contracts in this period called for reopening of negotiations when important changes in the index occurred. Although minor adjustments were made continuously in compiling the index through the years, another major change occurred in 1953 when the weighting basis for the C.P.I. was revised, based on a new survey taken in 1950 in 91 cities.

BLS Consumer Price Index. A cost-of-living index may be prepared in various ways to serve different purposes. The BLS index is intended to show only the percentage change from time to time in average prices. Thus, by the definition of the BLS: "The Consumer Price Index is a measure of the average change in prices of goods and services customarily purchased by families of wage earners and clerical workers living in cities of the United States."

As revised in 1953, the index indicated the average change in the prices of 300 different goods and services taken as a representative "market basket" of all goods and services commonly purchased by city families. The index was intended to reflect living costs among families of wage earners and salaried clerical workers living in cities with populations of over 2500. Based on a sample of more than 8000 families, results of the 1950 survey were carefully calculated to reflect the actual numbers of people living in different-sized cities in all parts of the country. It was intended to reflect living costs of families of moderate income; average family size was about 3.3 persons and 1952 family income after taxes averaged about $4160. Thus the C.P.I. was an index of living costs of only a certain segment of the urban population of the United States; many persons were not represented, notably residents of small towns and farms, bachelors, and wealthy families. In making the monthly index the BLS selected a smaller sample of 46 cities among whose residents price information was to be collected. The cities were carefully chosen as representative of all other cities in the country, and their relative importance in the total was weighted in proportion to their populations. Therefore the selected list included cities of all sizes, climatic conditions, income levels, and population densities. A representative market basket was constructed with about 300 items chosen to be recorded periodically and included in the index. The following classes of goods and services were included: food, housing, apparel, transportation, medical care, personal care, reading and recreation, and other goods and services. Efforts were made to provide standards for quality, and adjustments were to be made for changes in quality, availability, and buying habits.

In compiling the index the BLS collects price information as accurately as possible, either by direct questioning of consumers and retailers in 46 cities or

BLS CONSUMER PRICE INDEX, 1913–1955
(1947-1949 = 100)

Year	All Items	Food
1913	42.3	39.6
1914	42.9	40.5
1915	43.4	40.0
1916	46.6	45.0
1917	54.8	57.9
1918	64.3	66.5
1919	74.0	74.2
1920	85.7	83.6
1921	76.4	63.5
1922	71.6	59.4
1923	72.9	61.4
1924	73.1	60.8
1925	75.0	65.8
1926	75.6	68.0
1927	74.2	65.5
1928	73.3	64.8
1929	73.3	65.6
1930	71.4	62.4
1931	65.0	51.4
1932	58.4	42.8
1933	55.3	41.6
1934	57.2	46.4
1935	58.7	49.7
1936	59.3	50.1
1937	61.4	52.1
1938	60.3	48.4
1939	59.4	47.1
1940	59.9	47.8
1941	62.9	52.2
1942	69.7	61.3
1943	74.0	68.3
1944	75.2	67.4
1945	76.9	68.9
1946	83.4	79.0
1947	95.5	95.9
1948	102.8	104.1
1949	101.8	100.0
1950	102.8	101.2
1951	111.0	112.6
1952	113.5	114.6
1953	114.4	112.8
1954	114.8	112.6
1955	114.5	110.9

SOURCE: *U.S. Bureau of Labor Statistics*

by using reliable sources of statistical information. Prices are recorded for each item, weighted in terms of relative importance in the market basket, and the average change in prices is calculated as a percentage of the base period, which has an index number of 100. In the revised C.P.I., the period 1947–49 was chosen as the base. Thus an increase in average prices of one per cent over average prices in 1947–49 would be expressed as 101. As items pass into disuse and new goods become popular, the C.P.I. market basket drops the old unwanted items and includes the goods currently being purchased.

Uses of the Index. Frequent mention of the index in public discussion and by newspapers, radio, and television has made the public aware of the C.P.I. as a useful indicator of changes in the cost of living. Called the "nation's most influential statistic," it is a sensitive barometer of inflationary or deflationary tendencies in the national economy. For this reason both government and business firms use it as a guide in making policies with regard to such matters as credit, wages, prices, and employment. See CONSUMPTION; INDEX NUMBER; STANDARD OF LIVING.

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COSTS are the expenses of a legal proceeding which are assessed by the court against the unsuccessful party litigant. If the suit involves a protracted trial or the adducing of voluminous testimony before a master in chancery, the costs will likely be large. Collection of costs can be enforced by a writ of attachment against the property of the defeated litigant. Appellate courts often require the filing of a bond to cover costs in case the appellant loses his case on appeal.

COSTUME, a mode of dress, generally including any form of clothing or wearing apparel. More specifically it is a particular kind of wearing apparel, such as ceremonial dress of various kinds (theatrical, religious, or academic), or those forms of dress which designate particular professions or vocations (nurses' uniforms, military dress, or religious habits).

Why Costume? Clothing is commonly thought of as an expression of man's innate sense of modesty, as a means of protection from the elements, and as something that is supposed to "look good." While such considerations have had widespread application, anthropologists know that these conceptions have not been true for many societies and civilizations.

What was modest for the Victorians was considered indecent by Mohammedans. Japanese mixed bathing in the nude would have given a Victorian lady the vapors. A first century Roman sandal would have horrified a Chinese lady of the same era, to whom it was an unforgivable breach of taste even to mention feet, let alone show them. The Javanese, until the mid-twentieth century, saw nothing improper in the exposure of the female breast—it was left for Western visitors to disabuse them of that "pagan" notion. Among some Polynesian tribes custom decreed the propriety of dispensing with clothing altogether, provided a person was properly tattooed.

Similarly, clothing as protection from the elements follows no logical pattern. Nineteenth century women appeared in voluminous wrappings in midsummer heat; their 1929 counterparts braved wintry blizzards in knee-length skirts and silk stockings rolled to mid-calf. Modern man was timidly beginning to rebel against fashion's starched collar, long-sleeved shirt, tie, vest, jacket, and long trousers decree when, in the 1950s, a few brave souls decided to spend their summer working hours comfortably in knee-length shorts and open-necked shirts.

As for appearance, the exaggerated female bustle of the 1880s was thought hilariously funny and entirely senseless by visitors from the Eastern world. The long-necked beauties with platter-shaped lips, so highly esteemed by their fellow African tribesmen, were grotesque in Western eyes. The age-old simplicity of Chinese clothing, which depended upon beautiful fabrics for elegance, was not discovered by couturiers in the Occident until after 1950.

The one common element of costume, linking the varying modes and fashions in different times and places is that in almost every culture, primitive or civilized, Eastern or Western, costume has served to identify the wearer's role and position in society, particularly the complementary roles of man and woman. Usually costume has been employed to accentuate sex differences, and to act as a means of sex attraction. But exceptions to this are not hard to find. The costume of the priest or the monk, for instance, serves to deny differentiation by sex.

Primitive Dress. For primitive peoples, costume was largely a matter of adornment for social or religious reasons. A man's status in the tribe was expressed by the number of hunt and battle trophies he wore, and by his tattoos. He could endow himself with the prowess and virtues of an admired creature by wearing a symbolic representation of the animal in the form of jewelry. His gods could be pacified and their protection secured by the wearing of amulets and charms. The men (hunters, fighters, priests) enjoyed the privilege of wearing jewelry, while women had to content themselves with amulets that were supposed to guarantee successful pregnancies and strong sons. Climate, of course, played a role in evolutionary changes of costume. As men from the tropics ventured northward, some protection in the form of clothing became necessary. Materials at hand were used—fur skins for warmth, feathers for protection from rain, strips of leather to protect feet from rocky soil. But the *role* of the person determined the way he could or could not wear these protective garments.

Egypt. Although many changes occurred in Egyptian dress throughout the more than 3000 years of Egyptian dynastic history, certain characteristics were retained from 3000 B.C. through the centuries. Male attire was more elaborate than female; white was the predominant color; a fine, almost transparent linen was the principal fabric; and the characteristic headgear of the upper classes was a wig worn over the shaved head. A short kiltlike garment (*schenti*) for men and long tight skirts for women were the

METROPOLITAN MUS. OF ART

A Tanagra-type figurine, right, of the fourth century B.C. shows a young woman wearing straw hat, cloak, and tunic; left, Egyptian official and wife in nineteenth dynasty dress.

rule; adornment for the upper body was confined to large metal collars and armlets. Wide belts of leather or metal held the kilt or skirt in place. Both sexes shaved their heads, but wore wigs on formal occasions; priests often wore false beards as symbols of dignity and authority. In the early dynasties only priests and royalty wore head coverings in the form of crowns or diadems; the wearing of footgear (thong sandals) was restricted to the priesthood. During later dynasties the basic garments were retained, but elaborate cloaks, bonnets, and a variety of finely wrought jewelry were added. Throughout Egyptian antiquity the lower classes wore only loin cloths, and slaves went naked. Children were dressed much like their parents.

The Middle East. The Assyrians and Babylonians, 1500–550 B.C., covered the body more completely than the Egyptians, and used a great deal of ornamentation. Both men and women wore a simple ankle-length tunic, fringed at the bottom. The cloth, heavily embroidered, was bordered and decorated with all-over patterns. A second garment, a kind of shawl, was worn over the tunic. Both men and women wore their hair long, in a knot or mass at the back, with two plaits crossing underneath and over the forehead. Beards were sometimes worn. The feet were bare, although around the seventh century B.C. sandals became popular. Important personages wore large hats or turbans. Throughout Asia the amount of clothing worn indicated social rank; the slave class was often naked, the ruling class heavily clothed.

Later Persian costume, while continuing the Babylonian and Assyrian tradition of heavily decorated fabrics, added several important changes. An innovation circa 400 B.C. was the *candys*, a cut and sewn tunic shaped to the body and worn over a shirt and trousers. At first the *candys* was worn only by the nobility and was always a gift from the king, but later the costume came into more general use. A wide sash was worn over the *candys* by both men and women, and women attached a little purse to their sashes for holding "girdle money," or small change. The Persians wore soft shoes, always of yellow leather shaped to the foot and sometimes embroidered with golden threads and jewels. Royalty wore tiaras and *miters*, conical-shaped hats of the type worn by bishops until a much later date.

Ancient Greece. In the course of the Mycenaean period, 3400?–?1000 B.C. there were many changes in the mode of dress, but again certain distinguishing characteristics were retained throughout the period. Chief of these were the tight, wide belt, worn by both men and women, which gave the figure a wasp-waisted look; the brief loincloth for men; and the long bell-shaped skirt for women. Women often wore little pleated aprons over their skirts, which were sometimes ruffled and flounced, but wore nothing above the waist. Somewhat later tight leather bodices with sleeves appeared. These were laced tightly over the diaphragm of the body, leaving the breasts exposed, and were worn with long skirts made in pleated tiers. Both sexes wore the hair long in a loose tail down the back, and much elaborate jewelry. Lightweight leather boots or sandals were worn, but the heads were rarely covered.

ART INST. OF CHICAGO

Diana, fifth century B.C. Etruscan sculpture, wears Greek-influenced clothing and a typical hair style.

METROPOLITAN MUS. OF ART

***The Claudius Family*, first century Roman sculpture, shows men in togas, women in draped mantles. Children wore the same dress as their elders; upper class men wore wreaths.**

During the Homeric Age, after 1000 B.C., Hellenic clothing was formed from large rectangles of cloth, uncut and unsewn, draped about the figure in tunic-like garments held in by belts pinned together at the shoulders. Another piece of cloth, draped over the head and shoulders, served as a cloak (*chlamys*). The tunic, or *chiton*, was worn short by men, and long, sometimes trailing, by women, Variations of the *chiton*, decorated or plain, colored or pure white, were worn by both sexes throughout the centuries. Another type of cloak, the *himation*, also worn by both sexes, was a piece of colored wool draped over the left shoulder; married women wore it draped over their heads as a shawl. Wide-brimmed hats were worn by the peasantry, small caps by workmen, and little peaked caps by both ladies and gentlemen for traveling. A high-crowned, broad-brimmed hat, the *petasos*, was also worn by the gentry for traveling and as protection from sun and rain. Sandals were worn by both sexes, and men wore laced boots for hunting or traveling. Jewelry made of precious metals was worn mostly by women. Both men and women wore their hair long, for short hair was indicative of low status.

Rome. Roman costume developed along lines similar to that of Greece, being based on the garment formed from an unsewn piece of cloth. Later the garment was sewn at the sides and shoulders, forming a short-sleeved, knee-length shirt, the *tunica*. Over this was worn a long mantle, or *toga*, the symbol of citizenship, an elliptically shaped piece of cloth draped over the left shoulder and under the right arm, and falling to the ankles. Women wore floor-length *tunicas* and *pallas*, togas which could be draped over the head. Slaves and those in political disfavor were forbidden to wear the toga; freedmen were permitted to assume it. A person's status could be determined by the decorations added to his toga: a senator's was purple-bordered, a consul's was embroidered with golden thread, the emperor's was purple banded with gold. Athletes and soldiers, of course, wore shorter garments, usually pleated kiltlike affairs with wide leather belts. Footgear consisted of sandals and lightweight boots, with socklike foot coverings sometimes worn under the sandals. Hair went through various stages in style, from simple short haircuts to elaborate curled, dyed, and lacquered displays.

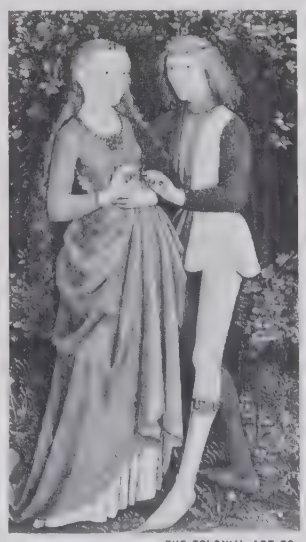
Byzantium. The first important evidence of a change to figure-fitting clothes appeared in Byzantium in the first century B.C. Yet while the garments became slightly more form fitting, they still were essentially loose, and the more splendid the dress the more ample and long it was. Three garments were used by both men and women. The tunic, when worn by a man, ended at the knee; when worn by a woman it reached the ankle. The *dalmatica*, of cotton, linen,

METROPOLITAN MUS. OF ART

Panel from Church of San Vitale, Ravenna, shows sixth century Byzantine dress.

or wool, was long and straight but went over the head like a tunic and was usually worn without a belt. The third piece of apparel was a heavy silk wrap, a straight length of cloth worn around the shoulders with the ends caught on the right shoulder by a clasp. Shoes were of soft leather with pointed toes, and completely covered the feet. Byzantine weavers of the third century developed a method of weaving patterned fabrics, and under the patronage of the Emperor Justinian, 527–65, the cultivation of silkworms was attempted for the first time in the Occident. These developments had far-reaching effects on the later evolution of European costume. The Byzantine mode was the foundation of Russian costume, and its influence survived for many centuries in vestments created for members of the Russian clergy.

Medieval Europe. In the first centuries of the Christian Era Western European dress retained many of the characteristics of Greek and Roman costume. Tunics, cloaks, and sandals were still worn, but fabrics became much more decorative and accessories more ornate, probably owing to Byzantine influence. Trousers to the Romans had been a sign of the barbarian (who wore laced leather breeches), but Roman soldiers stationed in northern outposts soon began to wear them for warmth. The style eventually became a fad in Rome, and was in fairly general use about the fifth century. With the trousers was worn a short tunic of leather, at first little more than a skin doubled over and laced up the sides, with a slit for the head. Later this doublet was adapted to fabric, and a center opening with thongs and buttons was added. Women continued to wear long tunics, but added short over-tunics (kirtles) and hooded mantles. Byzantine shoes became popular. The clergy continued to wear the old style of tunic and toga, which became the basis of later ecclesiastical dress.



THE COLONIAL ART CO.

Young gentleman of the fifteenth century wore a scalloped doublet and long tight hose; his lady wore a simple gown with a tight bodice.

Northern European (Gallic and Norman) influence in costume was firmly established throughout Europe by the tenth century. The laced boots and thigh-length boot-hose of the Gauls were accepted items of male dress. The boot-hose later became long fabric tights attached to the shirt at the waist, over them were worn short puffy breeches. Both sexes wore cloaks with hoods that could be pulled over the head for protection from the elements. In the eleventh century the tunic reappeared for a short time as a cut and fitted garment, with sleeves and long slits at the sides. Called a *bliaud*, it was worn knee length over breeches and hose by men, and floor length by women. Women added short fur-lined capes (pelissons) to their costumes, and wore veils over their long, braided hair. Men wore their hair short, and berets and flat-brimmed hats were the mode. In the fourteenth century the overcoat for men appeared as a very full, short garment, often with wide, puffed sleeves. During this century footgear assumed fantastic shapes, with long pointed toes turned upward sometimes as far as the knees to which they were caught with garters. Female headgear rivaled shoes in fantasy—the *hennin*, a towering cone with a veil floating from its peak, made its appearance. Typically fifteenth century were the slashings which appeared in Swiss costume after the defeat of the Duke of Burgundy. The Swiss soldiers mended their tattered clothes with strips of tents and banners left behind by the French; the fad was soon taken up by the rest of Europe and eventually went to extremes, some garments being made of only enough fabric to hold the slashings together. At the same time a fancy for elaborate underwear developed, which was not surprising since so much of it could be seen through the slashes.

Renaissance Europe. In the sixteenth century, European dress, at least for the upper classes, became lavishly ornate and reflected the world's widening horizons. Women's dress underwent radical changes, from the more or less simple tunics of previous centuries to elaborately decorated creations with tight bodices, enormous puffed sleeves, and skirts stiffened by farthingales (hoops). Pleated collars became stiffly starched ruffs—huge wheels of starched linen completely encircling the neck. Later the ruffs proved so uncomfortable that they were supplanted by tremendous fan-shaped collars standing up at the back of the neck. Hennins were replaced by small head-covering Brittany caps, frequently decorated with jewels and lace. Sixteenth century paintings show men's costumes to be as decorative as those of women. In France and England men wore short capes, doublets with peplums, turned-down collars instead of the wheel-shaped, stiffly starched ruffs, knee breeches or short trunks, long hose elaborately gartered below the knee, and hats with large rolling brims. Heels on the shoes were high and the shoes themselves had tops reaching to the mid-leg. Gauntlets, heavily decorated with embroidery, were in vogue. More carefully fitted clothes for women led to the introduction of the steel corset, and the funnel-shaped hoop was replaced by the barrel type. Tight basques made the contrast in these two skirt silhouettes noticeable. Sleeves were large, especially at the top.

METROPOLITAN MUS. OF ART

This painting of Queen Elizabeth I of England shows late sixteenth century styles, with large stiff velvet collar and overlace, elaborate puffed sleeves, and a feather fan.

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Lavishly embroidered doublets, lace collars, cuffs, and large-brimmed cavalier hats were worn by seventeenth century gentlemen, as shown in this portrait by Frans Hals.

In the latter part of the seventeenth century—sometimes called the age of lace, ribbons, and buttons—the medium-full skirt, snug bodice, low-cut, elbow-length sleeves, and lace ruffles made gowns both graceful and elegant. The hoop was eliminated after 1630. Satin and velvet slippers with heels 3 inches high were worn, and small round caps and hoods became popular. The large-brimmed hat of the cavalier, the fur-lined cape, and the crisp sheer white collar above the high collar of the doublet showed a Spanish influence. A flat linen collar edged with lace was popular with the Dutch and became so in other countries. A typical costume included a short-waisted doublet with many buttons, bouffant trousers, long silk stockings, and low shoes. Later in the century the trousers came below the knee and were tight; cavaliers wore high soft boots.

METROPOLITAN MUS. OF ART

A portrait, 1532, by Holbein the Younger, shows the shawl-collared cloak, cut-velvet sleeves, and popular flat, brimmed cap.

Post-Renaissance. During the 1700s, English costume lost some of its elegance, for the Georgian kings were not fashionable and frowned on extravagance. Until the middle of the century the coat and waistcoat remained long. Only one button at the waist held the waistcoat together, exposing fashionable fine linen ruffles or lace. Velvet breeches were met at the knee by long, colored silk stockings. The periwig, a small, powdered wig which was parted, puffed, and twisted, became popular. A large-brimmed hat was worn turned up on the left side and decorated with a ribbon rosette. The latter part of the century brought the abbreviated waistcoat and the cutaway coat. Women again began to wear a moderate hoop with a full skirt and low-cut bodice. Embroidery, which was visible through the open front of the skirt, was used on underskirts as well as on outer clothing. This full-skirted dress was replaced by a loose, hoopless gown known as a sacque. Colored fashion plates of the period show short waists, long or short puffed sleeves, low necks, and straight-cut skirts. Gay color was used in shoes and gloves, and heavy jewelry was popular. Small bonnets, some with poke brims, were worn. Late in the century the hair or wig was worn high and powdered heavily.

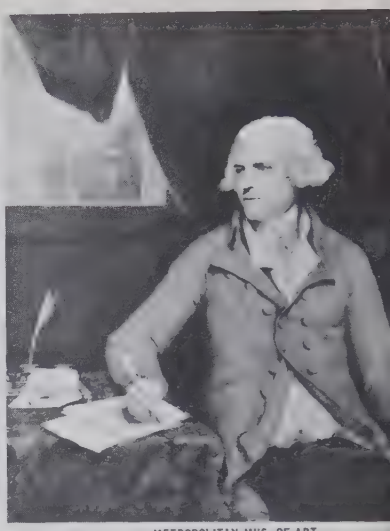
The period of the French Revolution, 1789–95, brought radical changes in the mode of dress—changes which affected all of Europe and extended to the various colonies. With the fall of the French monarchy, extravagant display disappeared and simple "citizen's dress" became the accepted mode. Women's costumes returned to ancient Greece for inspiration: simple, free-flowing lines, almost unadorned, showed off the uncorseted feminine figure, hair was cut short or worn in Grecian knots, and high-heeled shoes were replaced by simple heelless slippers tied with ribbons. In men's clothing the principal change was from breeches to trousers, which were held up by suspenders; with them appeared hip-length jackets buttoned at the waist. About 1794 the painter David was commissioned by the French government to create a national male costume. His design, which was accepted by the majority of men, consisted of tight trousers, short boots, a vestlike tunic, and a short coat; this outfit, too, reflected classical (Greek) simplicity.

Nineteenth Century. In the first part of the nineteenth century clothes continued to follow the natural lines of the body. Men's coats, cut straight at the waistline with slanting tails, were double-breasted with lapels. Trousers were popular for the first time in England. Elaborate buttons of silver, cut steel, or precious metals with gems, furnished decoration. White shirtfronts with fluted frills showed above the coat, and a stock was tied about a high linen collar. Completing the male costume were a tall-crowned hat and low slippers, buckled shoes, or top boots. Side

COSTUME

METROPOLITAN MUS. OF ART

Goya's painting shows the style of elaborate clothing for children in late eighteenth century Spain.



METROPOLITAN MUS. OF ART

***Madame Leblanc*, left, painted by Ingres, shows early nineteenth century Empire style. *Sir Thomas Rumbold*, by Reynolds, displays a typical costume of the late eighteenth century gentleman.**

FRICK COLLECTION

Renoir painting shows the toque hats and fur-trimmed coats popular for women and children during 1880s.

METROPOLITAN MUS. OF ART

American men of the 1850s copied the Parisian long frock coats worn over the fancy waistcoat.

Winslow Homer's *Croquet Scene* shows short jacket, shirtwaist, and hoop skirt of mid-nineteenth century.

THE COLONIAL ART CO.

ART INST. OF CHICAGO

The Bustle of the 1880s, as Portrayed by Seurat

whiskers were popular, as was hair combed toward the forehead. Later in the century the corset returned to distort women's figures, although the waist line was normally placed. Printed fabrics of bright colors became popular and large-brimmed hats with feather, ribbon, and flower decorations were fashionable. By 1850 women were wearing bodices and reasonably comfortable, long, full skirts. These were followed, after the middle of the century, by full skirts supported by crinoline and later by huge metal hoops. This unnatural dress was difficult to manage and expensive to make: the reaction came in the 1860s with the "Bloomer Girl" creation—a short skirt ending just below the knee, with long, loose bloomers reaching to the ankles. But Amelia Bloomer's sensible design was rejected as "unladylike" by all but ardent feminists. It did, however, lead the way to feminine sports clothes. In the 1880s, the hoop having disappeared, an equally unnatural fashion for women appeared—the bustle. Meanwhile men's costumes had achieved a sort of *status quo* which was to change very little, except to become more and more drab, until mid-twentieth century.

Twentieth Century. At the beginning of the new century women in the Western world, except in areas with national costumes, were wearing tight corsets that pushed the chest and diaphragm forward and also created the effect of a bustle. Skirts were long and a high stiff collar topped the dress. Puffs and frills covered the sleeves, bodice, and hat. The next change brought a free body line and low neckline. In 1912 the shortened skirt appeared and was followed shortly by a tight skirt and a long tunic. Although the tunic was retained for several years, fuller skirts became popular once more. In 1921 the long waist with a short skirt made its appearance, a vogue that lasted at least 10 years.

During the mid-twenties, a veritable revolution in female attire occurred. Women threw away their steel stays, bared their arms, and chopped off their skirts above the knees. "Boyish bobs" were the rage in hairstyles, and women added to the boyish look by wearing tight brassières. Hats called cloches, resembling overturned basins, covered all of the hair and were worn low on the brow. Exaggeratedly high heels appeared on shoes and "flappers" teetered about on them precariously.

After 1930 dress designers began to experiment toward eliminating the monotony which had been noticeable in women's dress during the previous 10 years. Skirts became longer, the natural waistline reappeared, and the tailored suit for women became popular. Long skirts were used for evening and formal wear. Bravery in the use of color was increasingly evident and the design of hats became more imaginative. The effect of industrial changes was tremendous. Many previously unknown materials, such as rayon, nylon, and other synthetics, changed even the lines of garments; fabrics were produced more cheaply and more patterns and colors could be obtained. In short, the manufacture of ready-made clothes altered the whole fashion field. Moreover, the ready exchange of ideas through newspapers, periodicals, and motion pictures helped to change styles more rapidly. Mid-twentieth century found fashions varying almost yearly, in contrast with the quarter- and half-century changes of earlier periods.

By 1956, costume-conscious women could purchase "fur" coats made of synthetic fabrics, transparent shoes made of vinyl plastic, and raincoats that could be folded into a pocket-sized envelope. Probably the greatest advance of the century was in the field of active and spectator sports fashions—the new freedom of women brought with it a variety of functional and beautiful clothes designed for more active living.

Although since the close of the eighteenth century fashions in men's clothing had changed little in comparison with women's, after World War II there were indications of new trends. Men began to break away from somber hues and conservative materials with a new type of clothing—"leisure wear"—the first step toward more color and more freedom in

BROWN BROTHERS

The "flapper" styles of the 1920s featured low waistlines, sacklike bodices, knee-length skirts, and deep cloches. Chiffon and velvet were popular fabrics during the period.

NEW YORK DRESS INST.

Modern American fashions dictate glamorous styles in dinner dresses for women, like this Pakistan silver brocade, with Indian gauze overskirt and transparent-yoke bodice.

men's clothing. This was particularly apparent in summer fashions; loose, colorful shirts worn over lightweight trousers became acceptable leisure clothing. Business suits, however, were little changed from the century-old pattern of dark or neutral color and woolen fabric of conservative weave; any changes in them were minor fashion points. The trend then, for both men and women was toward clothing of lighter weight, suited for many and varying activities. In men's clothing especially, this was accomplished by blending natural and synthetic fibers. Yet with all these changes the function of costume as an indicator of role and status in social life remained its essential one, regardless of the many other attributes the art of costuming had acquired over the centuries. See FASHION; HAIRDRESSING; SHOES; JEWELRY.

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COTABATO, province, Philippines, on S Mindanao, bounded by the provinces of Lanao and Bukidnon on the N and Davao on the E, the Celebes Sea on the S, and Moro Gulf on the W; area 8868 sq. mi.; pop. 439,669. The province consists chiefly of a central lowland, crossed by the Pulangi River and ringed by mountains. The highlands rise to more than 9000 feet and include active volcanoes. Rice, fruits, coconuts, rubber, and vegetables are the main crops. Most of the inhabitants are Moros. Cotabato is the capital and principal city of the province.

COTANGENT. See TRIGONOMETRY, *Trigonometric Functions;* TRIGONOMETRY: CURVES OF FUNCTION.

CÔTE D'AZUR, the popular European name for the French Riviera, which extends for more than 100 miles along the Mediterranean from Hyères to the Italian border. This strip of coast is for the most part very narrow, rugged, and heavily indented. It provides magnificent scenery, which is heightened by the generally intense blue color of the sea and sky, well observed from the Corniche highways and the innumerable villas and hotels at or between such famous resorts as Cannes, Nice, Antibes, Villefranche, and Menton, and the principality of Monaco. See RIVIERA.

CÔTE-D'OR, department, E central France, in Burgundy, bounded by the departments of Aube and Haute-Marne on the N, Haute-Saône and Jura on the E, Saône-et-Loire on the S, and Nièvre and Yonne on the W; area 3393 sq. mi.; pop. (1954) 356,839. The department is largely composed of uplands, principally the Plateau of Langres in the north and the Côte d'Or in the southeast. The Saône, Seine, and Armançon are the principal rivers. The Burgundy Canal, linking the Saône and Yonne rivers, cuts across the department. Agriculture is the main occupation and Côte-d'Or is noted for burgundy wine production. Nuits-Saint-Georges and Beaune are the major vineyard centers. Other crops include grain, potatoes, and vegetables. Sheep and cattle are the most important livestock. Dijon is the capital of the department.

CÔTENTIN, THE, or **COTENTIN PENINSULA,** peninsula, NW France, projecting into the English Channel from NW Normandy, forming the N section of the department of Manche. The Cotentin is about 50 miles long and averages some 25 miles in width. Its northern extremities are Cape La Hague in the northwest and Barfleur Point in the northeast. The peninsula is made up of rolling farm country, particularly noted for cattle raising and apple growing. Cherbourg, on the northern coast, is the principal city in the area. The Cotentin is an old Norman county and derives its name from Coutances, the former capital. During World War II American forces landed on the eastern coast of The Cotentin on D-Day, June 6, 1944, and, after overcoming stubborn German resistance, occupied the whole peninsula by August 1.

CÔTES-DU-NORD, department, NW France, Brittany, bounded by the English Channel on the N, and the departments of Ille-et-Vilaine on the E, Morbihan on the S, and Finistère on the W; area 2787 sq. mi.; pop. (1954) 503,178. The department consists of level or rolling country and has a rocky, indented coastline with many small islands. Agriculture is the main occupation, with grain, potatoes, flax, fruits, and vegetables the more important crops. Côtes-du-Nord is noted for apples and cider. Cattle and horses are the chief livestock, and fishing is of major importance. Mineral resources in the department are of minor significance although zinc and lead are produced. Many tourists are attracted to Côtes-du-Nord, particularly the picturesque coastal area. Saint-Brieuc is the capital of the department.

CÖTHEN. See Köthen.

COTILLION, a dance form popular in the eighteenth century French court. The name *cotillon,* meaning petticoat, apparently came from the words in a popular French song: "My dear, when I dance, does my petticoat show?" A brisk, lively dance, similar to the quadrille, it developed in England and America into a long and elaborate form of round dance to the music of waltzes, polkas, mazurkas, and galops. A long succession of devices for the selection of partners under the direction of a master of ceremonies was a feature of an evening-long cotillion, and favors were given to the guests.

COTONEASTER, a genus of European plants belonging to the rose family, *Rosaceae.* The species are shrubs or small trees, some evergreen, with simple entire leaves, somewhat woolly beneath. They have

small flowers in lateral cymes, and small, unpalatable, but bright-colored fruit, persisting in winter. There are about 40 species, many of which have been introduced as ornamental shrubs in the United States.

COTONOU or **KOTONOU,** town, French West Africa, in Dahomey, on the Gulf of Guinea, about 65 miles W of Lagos, Nigeria. Cotonou is a seaport serving an agricultural area producing mainly copra, palm kernels, palm oil, cotton, and coffee. Industries principally involve the processing of agricultural products. Cotonou has an airport, government buildings, and missions. Pop. about 22,400.

COTOPAXI, formerly León, province, N central Ecuador, bounded by the provinces of Pichincha on the NW and N, Napo Pastaza on the E, Tungurahua and Bolívar on the S, and Los Ríos on the SW; area 1781 sq. mi.; pop. (1950) 165,602. Cotopaxi province is located in the Andes Mountains and is largely highland. It includes several active volcanoes, among them Cotopaxi. The Patate River is the principal stream. Most of the province has a temperate climate and a winter rainy season. The higher peaks are snow-capped throughout the year. Numerous disastrous earthquakes and volcanic eruptions have occurred in the region. Agriculture is the main occupation in Cotopaxi; grain, potatoes, fibers, vegetables, and fruits are the leading crops. Cattle and sheep are the most important livestock. Various mineral resources in the province include gold, silver, and copper. Latacunga is the capital and principal city of Cotopaxi.

COTOPAXI, active volcano, N central Ecuador, on the NE border of the province of Cotopaxi, 32 miles S of Quito. Cotopaxi rises to an elevation of 19,344 feet and is believed to be the world's loftiest volcano. It is one of the most beautiful mountains in the world but is rarely fully visible because of clouds. The volcano is permanently snow-capped and symmetrical in shape but for the Cabeza del Inca (Inca's Head), a secondary cone on the southern slope. Cotopaxi continuously emits smoke and has erupted on numerous occasions, frequently at a great loss of life and property in the surrounding area. The cone was first climbed by Wilhelm Reiss in 1872.

COTRONE. See Crotone.

COTSWOLD HILLS or **COTSWOLDS,** range of hills, W England, in Somersetshire, Gloucestershire, Oxfordshire, and Wiltshire, extending for about 50 miles NE from Bath. The hills have an average elevation of about 500 feet and rise to a maximum of 1083 feet in their northern section. The Cotswolds are noted for picturesque scenery and attractive villages built in a characteristic style from the local limestone. During the late Middle Ages the region was important for wool weaving and numerous fine Perpendicular style churches remain as monuments to the weaving prosperity. The Cotswold Hills are mainly agricultural. Sheep raising is particularly important and the Cotswold breed of sheep is named for the hills.

COTTA, JOHANN FRIEDRICH, Baron Cotta von Cottendorf, 1764–1832, German publisher, was born in Stuttgart, and was educated at the University of Tübingen. In 1787 he took over management of the publishing house which had been established in 1659 by Johann Georg Cotta, his grandfather. In 1795 young Cotta with the poet Friedrich von Schiller, founded the literary journal *Horen,* and in 1798 began publishing the *Allgemeine Zeitung,* a newspaper which became an important medium for the dissemination of the works of many of the most famous German writers of the day. In 1811 Cotta opened a Stuttgart branch of the publishing house, which had by this time become one of the most influential in Germany. He also was active politically; was interested in and practiced progressive farming; and was one of the first to try a steam-driven printing press.

COTTAGE HOLDING, a parcel of agricultural land in England cultivated by members of a household to raise products for their own consumption. Such holdings became prevalent in England during the early years of the Industrial Revolution, when many factory workers found it necessary to supplement their meager wages by raising their own food. In many countries of continental Europe, similar family plots provide food for the low-income workers and tradesmen. In the United States, where the size of these holdings was never regulated by law, subsistence farming was fairly common prior to the concentration of industry in urban centers. During the early 1930s, some of the government-sponsored housing projects included subsistence plots for the low-income families.

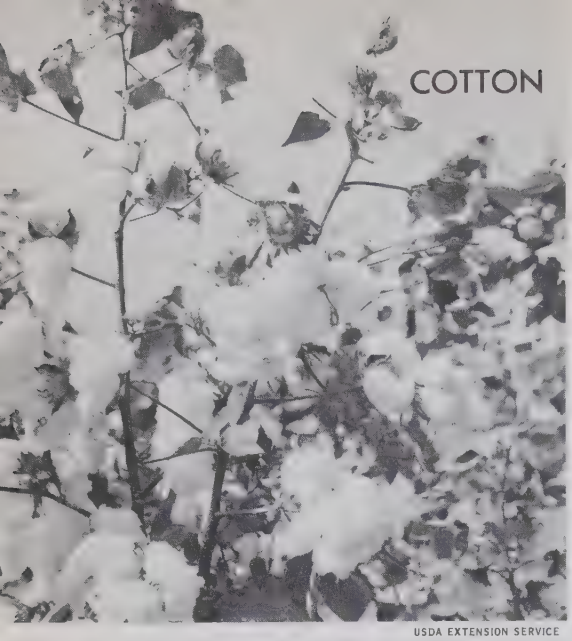
COTTBUS. See Kottbus.

COTTET, CHARLES, 1863–1925, French painter and etcher, was born in Le Puy. Cottet started as a progressive artist, but later changed from a gay impressionist color scheme to a dark and heavy technique. Much of his work portrays the melancholy of the people along the somber coast of Brittany. Cottet also painted many Venetian, Spanish, North African, and oriental subjects. His works include *Evening Rays, Port du Camaret, Burial in Brittany,* and a triptych, *In the Country of the Sea.*

COTTIAN ALPS, a division of the Western Alps, on the borders of France and Italy, between the Maritime Alps on the S and the Graian on the N. The western section of the Cottian Alps is known as the Dauphine Alps and includes the peak Barre des Écrins (13,461 ft.). Lofty peaks in the Cottian Alps proper are Monte Viso (12,602 ft.) and Aiguille de Chambeyron (11,155 ft.). See Alps.

COTTON, CHARLES, 1630–87, English poet and translator, was born in Beresford, Staffordshire. After the Restoration in 1660 he occupied himself mainly with translations, of which that of Montaigne's *Essays* (1685) was the most important, and with miscellaneous writings, including the descriptive poem, *The Wonder of the Peak* (1681). He was an enthusiastic gardener and angler, and was a friend of Izaak Walton. He contributed a treatise on fly fishing to the fifth edition (1676) of Walton's *Compleat Angler.* A collection of Cotton's poems was published in 1689. His other works were *Scarronides, or: The First Book of Virgil Travestie* (1664, reprinted with a fourth book, 1670); *The Planter's Manual* (1675); *Burlesque upon Burlesque* (Lucian, 1675).

COTTON, JOHN, 1584–1652, Puritan clergyman known as the Patriarch of New England, was born in Derby, England. After attending Cambridge University, he became vicar of St. Botolph's Church in Boston, Lincolnshire, 1612, where he was a brilliant and influential preacher. Soon he began to change the Church of England liturgy and introduced a Puritan form of worship, but it was not until 1632 that he was summoned to appear before the Court of High Commission on charges of nonconformity. Cotton fled to London and resigned his post. In 1633, accompanied by some of his parishioners, he went to the Massachusetts Bay Colony, and soon was teacher of the First Church of Boston. An impressive man of learning and industry, Cotton quickly became a dominant figure in political as well as religious affairs. But as the colony grew it was shaken by a prolonged antinomian controversy, in which Cotton first took a liberal stand but later joined in the persecution of Anne Hutchinson. In time Cotton allied himself with those who were bigoted and reactionary. In his first controversy with Roger Williams, over church membership, Cotton had taken a liberal view; but in the second dispute he asserted that the magistrates should have authority over both the religious and the secular affairs of the colonists. Cotton was a stanch Congregationalist, and became leader of that church in New England. He had little faith in the common man, a fact which may account for his shift from religious liberalism to bigotry. Cotton's many works include *The Keyes of the Kingdom of Heaven* (1644), *The Way of the Churches of Christ in New England* (1645), and *Spiritual Milk for Babes* (1646). See Williams, Roger.



USDA EXTENSION SERVICE

COTTON, a fiber plant belonging to the mallow family, *Malvaceae*, and genus *Gossypium*. The soft fibers that surround its seeds are the most important natural fibers; the seed is valuable for its edible oil, linters, animal feed, and fertilizer. See FIBER; COTTONSEED.

Origin. Asia and tropical Africa in the Old World and South America in the New World appear to be the two principal centers where cotton originated. Relics of cotton fabrics from about 3000 B.C. have been found in India. Early European travelers to southern Asia returned with tales of strange "vegetable lambs" that grew on trees. Merchants carried cotton into Europe as early as 800, and Columbus found the crop in cultivation and the natives wearing cotton garments in the West Indies. Cotton fabrics have also been found among the ruins left by early American Indians.

Description. Plants of the genus *Gossypium*, including 20 species of wild and cultivated cotton, are conveniently divided into the New World and Old World species groups. New World cottons, with 26 pairs of chromosomes, include the important cultivated species, *G. hirsutum* and *G. barbadense*. Two other cultivated species, *G. arboreum* and *G. herbaceum*, are Old World cottons, with 13 pairs of chromosomes (see HEREDITY). The native American upland cotton, *G. hirsutum*, is more widely distributed over the world than any other economic species. The plants average 2 to 5 feet in height, the main stem bearing branches and leaves with three to five lobes. When they first open the flowers are creamy white, but soon turn pink. The fruit, called the bolls, varies in size and shape, and produces seed with lint fibers and, usually, short fuzz fibers. Varying from ¾ to 1¼ inches in length, the lint is fine to medium in texture. *G. barbadense*, the other important cultivated species, includes two types—sea island and Egyptian cotton. Sea island cotton is grown in the West Indies and to a lesser extent along the coastal areas of Georgia, South Carolina, and Florida. Egyptian cotton is grown in the Nile River basin and in some parts of the United States. These plants grow from 3 to 10 feet high and have large leaves with three to five lobes. The flowers are yellow and usually have a purple spot at the base of the petal. Bolls are smaller than in the upland type and yield less cotton. The lint is easily detached from the seed and is desired for its extreme fineness and long fibers, which range from 1½ to 2½ inches in length. It is particularly adapted to the manufacture of thread, hosiery, and fine textile goods.

The Old World cottons, *G. herbaceum* and *G. arboreum*, are not important economically and are being replaced by New World cottons, which have better lint quality. *G. herbaceum* is the upland cotton of India and is also grown in China, the Arabian Peninsula, Iran, Iraq, and Greece. *G. arboreum*, which includes the tree cotton of India, is grown in India, Burma, China, Korea, Japan, Formosa, and Africa.

Cotton is difficult to classify and plants vary widely, according to species and environment. In its wild state it is a perennial shrub or treelike plant; under cultivation it is a herbaceous annual. The plant is erect, with branches rising from the main stalk, and is supported by a deep taproot. Two buds develop in the axil of each leaf on the main stem and on the vegetative branches; the true axillary bud produces only vegetative branches and the extra-axillary bud produces the fruiting branch. The leaves are alternate and lobed, and the flowers are surrounded by four bracts. The unopened flowers and bracts together are called squares. The fruit is an enlarged ovary with three to five divisions or locks, and develops as a boll. Each lock in the boll contains from five to 10 seeds covered with long hairs called lint fibers and, in some varieties, short hairs called fuzz fibers. These fibers are single threadlike cells that extend outward from the seed coat. As the fibers develop the cell wall thickens and an irregular twisting occurs which may amount to several hundred twists per inch when the fiber is fully mature. Extent of twisting and length and fineness of the fiber make important differences in the spinning quality. At maturity the bolls break open and the seed cotton (seed with fibers attached) is exposed. Fibers account for about one-third of the weight of the seed cotton, the remaining weight being that of the seed. In cultivated cotton both self-pollination and cross-pollination by insects are common.

Growing, Harvesting, and Marketing

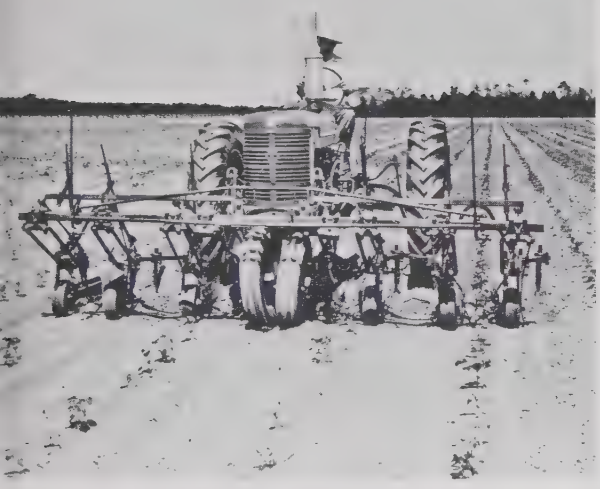
Cultivation. Cotton thrives in areas with a mean summer temperature above 77°F and a frost-free growing season of from 180 to 200 days; it requires considerable moisture and much sunshine. Cotton's early growth is favored by mild spring temperatures and light, frequent showers. Moderate moisture, warm temperatures, and much sunshine in the summer promote further growth; and dry, cool autumn weather brings the crop to good maturity. In areas lacking sufficient rainfall cotton can be grown successfully by irrigation. It grows well in a wide variety of soils ranging from sands to heavy clay soils. Ideally the soil should be fertile, well drained, and aerated; it should hold moisture well and be free of crop diseases and insect pests. Cotton does not deplete the soil severely and grows well in rotation with other crops. Rotation with legume crops is especially recommended because they supply nitrogen to the soil, restrict the growth of weeds, and help to prevent the spread of diseases and insect pests.

Cotton is usually planted on flat land on prepared beds or in shallow lister furrows. In preparing the seedbed, winter cover crops and residue must be cleared because buried stalks and residue clog planters, cultivators, and other machinery. They are usually disposed of by chopping with power shredders before the land is plowed. After autumn or spring plowing the seedbed is prepared; it must be well turned, firm, and free of weeds, and should contain ample moisture. Where irrigation is necessary the soil is moistened to a depth of 4 to 6 feet before planting. Cotton is planted at the earliest date that soil temperatures and moisture conditions permit, usually when temperatures reach 60°F at planting depth. In the warmer areas of the United States planting begins in March, but in cooler areas it is carried out in April or May. Care is taken to use pure seed of an adapted variety and high germination. Plants are uniformly spaced in rows 36 to 48 inches apart, averaging 40,000 to 80,000 plants per acre.

COTTON

Cotton is mechanically planted on irrigated land near Tucson, Ariz. To check disease, the seed is acid-delinted before planting.
USDA

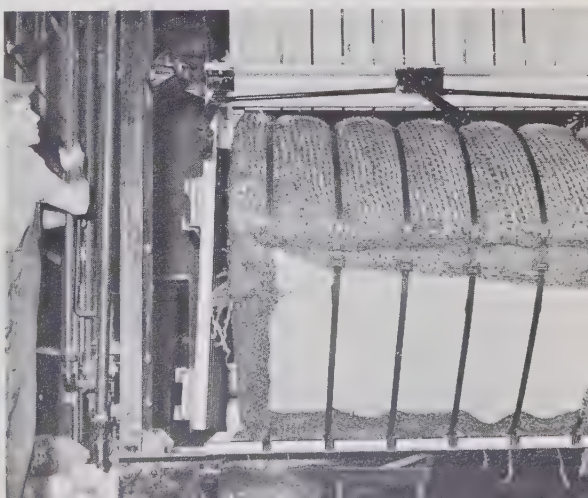
NATL. COTTON COUNCIL
A modern saw-type gin cleans seeds from 500 pounds of cotton in 10 minutes as compared with 50 pounds daily for Whitney's first gin.



A tractor-driven four-row cultivator tills a field of young cotton. For weed control, flame cultivators and chemicals are used.
NATL. COTTON COUNCIL

Used primarily in cotton with lush growth and high yield, mechanical cotton pickers easily cover from 5 to 15 acres per day.
NATL. COTTON COUNCIL

A 500-pound bale of cotton is tipped from baler after compressing. Bales are wrapped in heavy bagging and bound with steel strips.
LIB. OF CONGRESS



After the plants have emerged the first hoeing ("chopping") is carried out to eliminate small weeds and to thin and space the plants. In some areas mechanical cultivation and thinning are practiced. For weed control, sweep cultivators, rotary hoes, and hand hoeing are employed. Small shovels, used in cultivation on irrigated land, cover weeds with dry soil and open furrows for irrigation. Chemical weed control, including the use of pre-emergence chemicals and postemergence oils, is practicable in areas of high rainfall. Flame cultivators, which burn weeds along the cotton row, are also used. In irrigated areas water is applied by surface irrigation, subirrigation, or sprinklers. Water must be sufficient to prevent wilting and to maintain growth; 20 to 40 acre-inches of water are usually needed to produce a cotton crop.

Diseases and Insect Pests. Cotton plants are subject to many diseases, but losses from them are influenced by weather, insects, and crop management. Annual losses from seedling diseases, bacterial blight, fusarium and verticillium wilt, root and boll rots, and other diseases have exceeded $400 million annually. The use of resistant varieties, seed treatment, soil fumigation, and better cultural practices helps reduce disease losses.

Fields of cotton are infested by many insects, and as many as 700 different genera are involved. Some insects attack the plants, others are predators and parasites living on other insects, and still others frequent the fields but do not damage the crop. The most serious pests are the boll weevil, pink bollworm, cotton aphid, red spider, lygus bug, cotton bollworm (corn-ear worm), nematodes, and the cotton leafworm. Insect damage to lint and seed have amounted to almost $500 million annually. The amount of insect damage depends a great deal on climate and weather; proper use of insecticides and appropriate cultural practices usually reduce losses caused by insects.

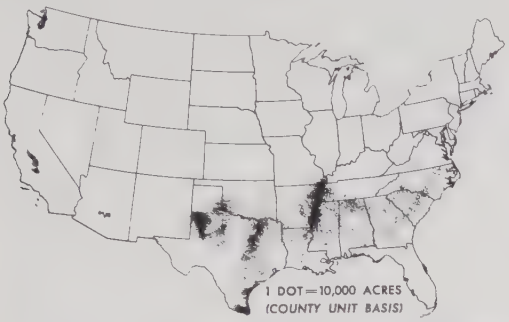
Harvesting. Most cotton is harvested between September and December, the period varying with climate and weather, plant variety, and cultural practices. The crop does not mature uniformly so that more than one operation is required to complete harvesting. In 1955 about 25 per cent of the entire U.S. cotton crop was harvested by cotton-picking machines, but the proportion was as high as 75 per cent in some states. Hand picking is slow and costly, but yields clean, good quality cotton. Picking methods vary widely. In a common method the picker uses both hands to pull the seed cotton from the open bolls and drops it into a sack (up to 12 feet long and about 30 inches wide), which he drags behind him. A picker can harvest from 150 to 400 pounds of seed cotton per day. In the High Plains area of Texas and Oklahoma the whole boll, including cotton and bur, is snapped off by hand. Two or three pickings are necessary in harvesting cotton by hand.

Mechanical harvesting is used increasingly because of its lower costs; under good conditions it is almost as efficient as hand picking. Cultural methods must be adapted to mechanical harvesting in order to increase picking efficiency and insure good cotton quality. Various kinds of machines have been tried, but only two, the spindle and stripper types, have become popular in the United States. A spindle-type harvester removes cotton only from open bolls without damaging plants or unopened bolls. Mounted on tractors, the unit consists of revolving vertical drums with many finger-like spindles which are synchronized

COMMON DISEASES OF COTTON

COMMON NAME	CAUSATIVE ORGANISM	DISTRIBUTION
Anthracnose or Pink Boll Rot	*Glomerella gossypii* (Fungus)	Occurs in humid areas where cotton is grown, mainly from the Atlantic Coast to Texas and Oklahoma
Bacterial Blight or Angular Leaf Spot	*Xanthomonas malvacearum* (Bacterium)	Generally distributed in areas where cotton is grown; especially damaging in the southwestern states
Crazy Top	Not known	Occurs locally, particularly in Arizona and California; especially prevalent on soils with shallow rooting zone due to impervious subsoil
Root Knot	Nematodes or Eelworms, several species	Occurs on light-soil types in all cotton growing states. The disease is soil-borne
Root Rot	*Phymatotrichum omnivorum* (Fungus)	Occurs in southwestern states and adjacent areas. Infected soils are most extensive in Texas
Rust	Faulty nutrition, especially lack of potash. Not parasitic	Occurs locally in humid sections of the cotton belt
Seed Rot: Seedling Blight	Several different species of fungus	Generally distributed in areas where cotton is grown
Fusarium Wilt	*Fusarium vasinfectum* (Fungus)	Occurs throughout the cotton belt. The disease is soil-borne
Verticillium Wilt	*Verticillium alboatrum* (Fungus)	Occurs throughout the cotton belt. The disease is soil-borne
MINOR DISEASES	Usually of less importance are sore shin (damping-off), several different	

with the forward movement of the tractor and engage and remove the lint from the plants that are guided through the unit. A rubber device (doffer) removes the lint from the spindles and an air stream blows the cotton into a basket. Stripper-type harvesters are used mainly in the High Plains area of Texas and Oklahoma, where cotton can be left in the field until fully open. This type is most efficient when used in low-growing, short-branched varieties of cotton. Older devices of this kind were sleds which combed the bolls from the plants with slot and finger strippers; modern tractor-mounted strippers remove the bolls by means of outward revolving rollers or a roller and a stationary bar. DUANE S. MIKKELSON



U.S. BUREAU OF THE CENSUS

Cotton Acreage in the Contiguous United States

Ginning and Baling. After harvest, the cotton is taken to a gin where the seeds are removed and the lint is baled for marketing. Upland cotton is ginned on a saw-type gin. To prevent damage to long staple fibers, American-Egyptian and other long staple cotton is ginned on a roller gin which squeezes the seed from the fiber. A saw-gin consists of a series of saws with fine teeth which project through ribs into a receptacle holding the seed cotton. The saw teeth tear the lint from the seed; brushes or air blasts remove the lint and convey it to a press. The ribs prevent seeds from being pulled through with the lint and they fall into a separate receptacle to be conveyed to a storage shed. The cotton is pressed into a bale weighing about 500 pounds, including 21 pounds of bagging and ties. The bale usually is covered with jute or burlap bagging and bound with steel bands (ties). A bale measures approximately 56 inches long, 28 inches wide, and 45 inches thick. In order to save space, bales are further compressed before shipping. Those going to mills in the United States are compressed to about one-half original size, and those being shipped abroad are compressed to about one-third. Most American bales weigh between 425 and 625 pounds each.

Economic Aspects

Marketing. When the cotton has been ginned and baled, the farmer sometimes sells it immediately but usually stores it in a public warehouse and sells it later when he thinks the price will be higher. Most farmers sell to buyers in the local markets near their homes. Local buyers, in turn, sell to merchants in such central markets as those at Memphis, Dallas, Atlanta, New Orleans, Houston, Phoenix, and Fresno from where it is shipped to spinning mills in the United States and abroad. Local markets are not

COMMON DISEASES OF COTTON

	SYMPTOMS AND EFFECTS	CONTROL
	Small to large spots appear on the bolls. The larger spots have reddish borders and pink or gray centers. Lint from diseased bolls is often stained and inferior or even worthless. Seed becomes infected, causing poor stands and seedling blight	Seed is treated with proper fungicide to prevent seedling blight. Rotation of crops, chemical defoliation of bottom leaves, and the use of resistant varieties are also helpful
	Numerous angular dead areas appear on the leaves. They become reddish brown to black with rusty to purplish margins. In some varieties, veins turn dark, followed by yellowing and falling of leaves. Parts of the main stem and branches may turn black. Bolls become spotted and may drop off. Infected seed may cause poor stands and seedling blight	Seed is treated with proper disinfectant. Crops may become infected from a neighboring field not grown from treated seed. Cover up cotton residue by deep plowing in fall
	Vegetative branches are produced in the upper parts of plants instead of the usual fruiting branches. Lower buds and bolls may drop off, making plants nearly sterile	Rotation with alfalfa often helps. Control moisture by irrigation
	Plants are stunted; leaves are pale green. Severe attacks may kill many plants. Roots show numerous irregular swellings ranging in size from that of a pinhead to one-half inch or more in diameter. When young the swellings are white; but may become brown later on	Control consists of rotation with alfalfa, barley, or other root-knot-resistant crops. In irrigated areas, clean fallow with deep summer tillage is recommended. Soil fumigation in cases of severe infestation
	Plants die suddenly when half grown or later, causing brown spots or irregular areas of dead plants in fields. Roots are rotted and bark is so shrunken and soft that it easily slips off the roots	Control consists of rotation with barley, corn, oats, sorghum, or other crops resistant to root rot. Alfalfa, cowpeas, and many other crops are susceptible to root rot. Nitrogenous winter green manure crops, such as vetch, that are resistant to root rot are used
	The disease occurs in irregular areas in fields. Plants remain small; in midseason leaves become mottled with yellow spots. These spots enlarge, become brown; finally the whole leaf curls and falls off prematurely	Soil fertility needs attention. Green or barnyard manure is used along with applications of potash or fertilizers containing potash
	Seedlings fail to emerge, or die after emergence, or become weak plants	Seed is treated with the proper fungicide
	Plants are unthrifty; they later wilt, shed leaves, and may die. When the lower part of the stem of a freshly wilted plant is cut open, the woody tissue is found to be brown or black	Wilt-resistant varieties are used. Liberal fertilization is helpful. Rotation with sorghum, peanuts, corn, or small grains is recommended
	Disease becomes conspicuous after rainy weather, as the plants approach maturity. First the lower leaves show chlorophyll deficiency between the veins, then the upper leaves. These areas on the leaves then die, turn brown, and the leaves fall off. Woody tissue on the inside of the stems turns dark	Use of resistant or tolerant varieties

leaf blights, leaf spot, internal collar rot, and several different kinds of boll rots.

BENJAMIN KOEHLER

LEWIS P. WATSON

The boll weevil, shown greatly enlarged, feeds upon the boll, then lays its eggs in the holes that have been made. The boll is eventually destroyed by the feeding larvae.

organized, but in each central market there is a cotton exchange where merchants meet to buy and sell cotton.

A third type of cotton market is called the futures market. There are two main ones in the United States —the New Orleans Cotton Exchange and the New York Cotton Exchange; there is also a small amount of futures trading in cotton on the Chicago Board of Trade. Futures markets were created to prevent the price of cotton from dropping very low during the harvest season and then becoming extremely high during the spring and early summer. On the futures market, cotton is bought for delivery in some future month. One of the main uses of the futures market is to protect cotton merchants, spinners, and others in the cotton business. For example, if a cotton spinner contracts to make some cotton cloth for a clothing manufacturer six months later, he will base his price on what the cotton will cost him at the present time. Knowing that the price of cotton could go up in six months and cause him to lose money, he may buy cotton on the futures market for delivery in a later month. In the meantime, if he finds the kind of cotton he is looking for, he sells an equal amount on the futures market, thereby canceling his obligations in that market. He avoids losing money because the differences between the "spot" price of cotton and the prices on the futures market are always about the same—if the price of one goes up, the prices of the others follow. Less than 2 per cent of the cotton sold on the futures market is actually delivered. See FUTURES.

The price received for cotton varies considerably with its quality. Determining quality is called "classing." Buyers class the cotton before buying it, but to get unbiased classing most farmers send samples of their cotton to the government classing service immediately after ginning. Classing consists of determining the "grade" and "staple" of cotton. Staple refers to the length of the fibers and is measured in thirty-seconds of an inch—for example, $^{31}/_{32}$ inch or $1\,^{1}/_{32}$ inches. Grade is determined by the color of the fiber, amount of foreign material in it, and the extent to which the fiber has been cut or otherwise damaged in ginning and handling. Most cotton is sold according to its class alone, but some merchants and mills have testing laboratories to determine the strength, maturity, fineness, uniformity of length, and exact length of cotton fibers. Most of the cotton sold is white, but as a result of damage by weather, insects, or other causes, a small part of it is spotted, tinged gray, or stained yellow. Official grade standards for American upland white cotton approved by the U.S. Department of Agriculture from the highest to the lowest grades are: Good Middling, Strict Middling, Middling, Strict Low Middling, Low Middling, Strict Good Ordinary, and Good Ordinary.

Uses. More than two-thirds of the fiber requirements of the United States are supplied by cotton, with domestic consumption amounting to more than 9 million bales annually. Apparel and household furnishings account for most of the uses, representing about three-fourths of the total. Altogether there are more than 2000 known uses for cotton, ranging from typewriter ribbons to women's fashions. For wartime purposes its importance is second only to steel. The automobile industry is the largest industrial consumer. Cotton is also used for bags, thread, insulation, cordage and twine, machinery belts, laundry supplies, tarpaulins, awnings, tents, hose, fishing supplies, wiping cloths, luggage, bookbindings, and caskets. Linters, the fuzz remaining on the seed after ginning, are removed at the cottonseed oil mill and used in hundreds of products. See COTTONSEED, *Linters*.

Manufacture. Peoples of India and the Far East were the first to spin and weave cotton. Most of this manufacturing was a hand process and entailed the use of crude hand cards, spinning wheels, and looms.

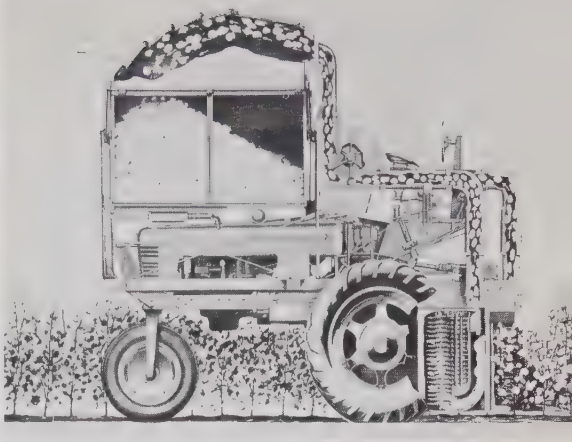
COMMON PESTS OF COTTON

PEST	DESCRIPTION	DISTRIBUTION
Cotton Boll Weevil *Anthonomus grandis*	Adult: beetle ¼ in. long, brownish gray with paler stripe on head, and long, dark reddish snout Larva: white body with yellowish brown head	Generally distributed in cotton-growing areas of North America
Cotton Bollworm (Corn Ear Worm) *Heliothis zea*	Adult: yellowish to light brown moth with darker mottlings on wings; 1½ in. wingspread Larva: 2-3 in. long; varies from greenish with longitudinal stripes to ivory colored without stripes	Widely distributed throughout North and South America and Hawaiian Islands
Pink Bollworm *Pectinophora gossypiella*	Adult: small brown moth with ⅜ in. wingspread Larva: pinkish white, ½ in. long	Generally distributed in cotton-growing areas of the world
Cotton Leafworm *Alabama argillacea*	Adult: brown moth, forewings marked with darker lines and two light and one larger dark spot; wingspread to 1½ in. Larva: varies from yellowish to velvety black with seven light stripes on back and sides; 1½ in. long	Chiefly in the Gulf states but also found in South America and West Indies
Two-Spotted Spider Mite (Red Spider) *Tetranychus telarius*	Minute, yellowish to greenish spider, usually with two spots on abdomen	Distributed throughout the world

Other pests of cotton include the cotton aphid, cotton flea hopper, cotton

NATL. COTTON COUNCIL

In hand picking, cotton is usually pulled from the boll with both hands and dropped into a long bag trailing from the picker's shoulder. Two or three pickings are made. The



INTERNATIONAL HARVESTER CO.

spindle-type harvester picks only from opened bolls, leaving the plant undamaged; picking with the stripper type must be delayed until all the bolls are fully opened.

During the Industrial Revolution in England many changes took place in modernizing these crude contraptions into powered processing machinery. During the eighteenth century Wyatt, Arkwright, Hargreaves, and Compton all made notable advances in textile equipment. See INDUSTRIAL REVOLUTION.

In the manufacture of yarns and fabrics from raw cotton several steps are needed to change the raw fiber into the finished product. In order to obtain a specific yarn strength many bales with different fiber qualities are mixed together. The cotton passes through a series of machines where the compact masses are opened to separate dirt and trash from spinnable fiber. The resulting large roll of matted cotton is carded and drawn to straighten the fibers and reduce the mass into a loosely twisted, ropelike roving. This is then wound on a large tubular bobbin. Together with long staple cotton, the roving is passed through a combing machine to remove short fibers and trash. After carding and drawing, the fibers are ready for spinning. Large bobbins of roving are placed on machines that carry it through a series of rollers turning at varying speeds. These rollers draw out the roving to make the fibers parallel and the yarn smaller; then the yarn is twisted onto a rapidly revolving bobbin. To make the yarns into cloth, they are woven by interlacing at right angles. One set of yarns is called the warp, the other, the filling. The warp is a number of yarns wound on a large spool called the loom beam. The filling is yarn wound on a bobbin and placed in a boat-shaped container (shuttle) which carries the filling from one side of the loom to the other. In traveling across the warp the shuttle places a thread between raised or lowered warp yarns. Various designs can be obtained by raising or lowering the individual warp yarns in a set pattern. The woven cloth is usually treated with a finish to make it more durable and attractive. Finishes to impart special qualities such as wrinkle-resistance and water-repellency are relatively new. The science of finishing has improved rapidly with chemical research in finding newer finishes and coloring processes. See TEXTILE.

History. Cotton was first planted in what is now the United States in 1536 by Spanish colonists in Florida, and later by English settlers in Virginia. Prior to 1775, however, practically all cotton used in America was imported from the West Indies. The invention of Eli Whitney's cotton gin in 1793 greatly stimulated the production and consumption of cotton, and it soon became a major factor in the social, economic, and political life of the United States. Demand

COMMON PESTS OF COTTON (Continued)

INFESTATION AND EFFECTS	CONTROL
Adults emerging from hibernation feed on young leaves. When squares are formed, females puncture them and deposit eggs. Later in the season bolls may be punctured. Larvae feed in squares and cause them to turn yellow, flare open, and drop from stalk. Infested bolls do not produce full bolls of cotton	General cultural practices to lessen insect damage include destroying stalks or plowing them under in the fall and the use of early maturing varieties of cotton
Larvae bore into and feed upon bolls and squares, causing squares to fall and bolls to rot	Insecticidal control programs are usually designed to control the boll weevil as the chief cotton pest, and at the same time, the other common cotton insects. When boll weevil infestation has reached 10 to 25 per cent, by count of number of punctured squares, application of insecticide is begun. Three applications four or five days apart are made and the infestation is again investigated; if it is not lowered, the applications are continued at the same intervals. Any of several insecticides may be used as either sprays or dusts. As dusts, 10 to 15 pounds per acre of any of the following are recommended: (1) a 3 to 5 mixture of BHC-DDT, (2) alternate applications of the same mixture with calcium arsenate, (3) 20 per cent toxaphene, (4) 2.5 to 5 mixture of aldrin-DDT. When applying in form of sprays, use same ratios of actual insecticide per acre as in dusts
Larvae bore into and feed upon bolls and squares causing squares to fall and bolls to rot	
Larvae defoliate plant. If larvae appear early, maturation of bolls is prevented. Late in the season defoliation is beneficial	
Mites suck juices from leaves, causing them to turn brown and drop off	For two-spotted spider mite control, sulfur, parathion, and aramite are recommended

thrip, cotton square borer, fall army worm, and others of lesser importance

for American-grown cotton increased rapidly in Europe in the first half of the nineteenth century, and cotton became "king" in southern agriculture. The need for new cotton land was an important factor in the migration southward and westward across the United States. The crop was adaptable to the use of slave labor and later to tenant farming. It grew in almost any type of soil, required few specialized tools and little special knowledge; and, most important, it was one of the few storable crops for which there was always a market. Cotton was consequently the only cash crop in many areas prior to the 1930s. Of all the great staple crops cotton is one of the least exhaustive of the soil, but continuous growing of cotton on the same soil damages the land's productive power. For many years, but especially in the depression 1930s, farmers were encouraged to rotate cotton with plant legumes and other green manure crops to replenish the soil.

Until the twentieth century cotton had been grown only in the South, but as farm mechanization advanced and improved irrigation methods were developed, cotton production was begun in California, Arizona, and New Mexico. These three states increased their production rapidly during the 1930s, with the greatest increase coming after World War II.

Cotton Belt. Historically, the Cotton Belt referred to a sweeping area of the southern United States ranging from South Carolina to Texas, including parts of Georgia, Alabama, Mississippi, Tennessee, Missouri, Arkansas, Louisiana, and Oklahoma. Climatic conditions determined its extent. Cultivation of cotton before the Civil War usually involved the use of Negro slave hands in this region so that its borders contained most of the slave population. After 1900, cotton broke out of these bounds with the advent of irrigation and mechanization in such areas as California, Arizona, and New Mexico.

Recent Trends. Scarcity of labor and the high cost of producing cotton by hand methods have resulted in a high degree of mechanization in cotton farming throughout the cotton belt. At the turn of the century, using hand labor completely—plowing, thinning, weeding, and picking—more than 150 hours of man labor were required to produce two-thirds of a bale of cotton to the acre. In 1955, by using tractor cultivation and machine picking, less than 50 hours of labor per acre were required.

Increased mechanization and improved farming practices enabled American farmers to produce more cotton than the market demanded, resulting in the accumulation of large surpluses. To avoid this, Congress after 1933 limited the number of acres farmers could grow in years when the surplus of cotton became too large. However, the total production continued high despite acreage controls. In 1954 and 1955, when the government allocated acreage on the basis of past yields, the application of more fertilizer, better insect control, and other practices resulted in more cotton per acre than ever before and a total national production more than one-third larger than planned.

AVERAGE COTTON PRODUCTION BY STATE, 1951–53

STATE	Bales*	Per Cent of Total
Texas	4,066,000	26.17
Mississippi	1,844,000	11.87
California	1,784,000	11.48
Arkansas	1,381,000	8.89
Arizona	940,000	6.06
Alabama	921,000	5.93
Georgia	806,000	5.19
Louisiana	774,000	4.98
South Carolina	739,000	4.75
Tennessee	625,000	4.02
North Carolina	520,000	3.35
Oklahoma	388,000	2.50
Missouri	384,000	2.47
New Mexico	310,000	1.99
Florida	30,000	.19
Virginia	18,000	.16
Total, United States	15,530,000	100.00

*Bale: 500 lb. gross weight SOURCE: *USDA*

UNITED STATES COTTON PRODUCTION, SELECTED YEARS
(in bales)

Year	Upland Cotton	American Egyptian
1942	12,363,307	73,808
1944	11,830,742	8,605
1946	8,514,892	2,386
1948	14,576,808	3,465
1950	9,848,183*	62,235
1952	14,861,108	93,467
1954	13,577,473	40,919
1955	14,663,000*	44,200

*Production controls in force SOURCE: *USDA*

The production of American-Egyptian cotton increased considerably in the early 1950s following several years of low interest among producers. In deciding whether to grow it, farmers in the area in which it can be grown—Arizona, New Mexico, and southwest Texas—were guided primarily by the difference between its price and that for upland cotton. As long as American-Egyptian sold for at least twice the price of upland cotton, many farmers preferred to grow it, but when its price dropped below that figure farmers turned to upland cotton, unless acreage controls prevented their doing so.

World Production. For many years prior to 1950 the United States produced about half of the world's annual supply of cotton. Later this percentage declined as a result of a considerable increase in production among many smaller producing countries. The accompanying table shows how production changed between 1930 and 1954.

LEADING COTTON PRODUCING COUNTRIES
(thousands of bales)

COUNTRY	1930	1949	1954
United States	13,932	16,128	13,679
India	4,373*	2,350	3,900
China (including Manchuria)	2,615	1,700	2,950
Russia	1,587	2,700	n.a.
Mexico	178	937	1,780
Brazil	483	1,300	1,600
Egypt	1,715	1,796	1,598
Pakistan	*	1,000	1,245
World Total	26,230	31,280	36,840

*Pakistan and India combined SOURCE: *USDA*
n.a.—not available

In addition to the countries listed in the accompanying table, Peru, the Sudan, Turkey, Iran, Syria, Uganda, and the Belgian Congo produced substantial amounts of cotton. The main cotton exporting countries were the United States, Egypt, Brazil, Mexico, Pakistan, Turkey, the Sudan, and Peru. The main cotton importing countries were Japan, the United Kingdom, France, West Germany, Italy, India, and Canada.

V. R. CARDOZIER

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COTTON BELT. See COTTON.

COTTON BOLL WEEVIL. See BOLL WEEVIL, COTTON.

COTTON BOLLWORM. See CORN EAR WORM.

COTTON FAMINE, the crisis in the British cotton mills during the American Civil War. Before the war, English cotton manufacturers obtained more than 75 per cent of their raw material from the southern United States. Southern leaders expected that by withdrawing cotton from the market they would induce Britain and France to support the Confederacy. However, the cotton crop in 1859 and 1860 had been heavy and the Lancashire mills had a surplus in 1861. Consequently the effects of the withdrawal and the Union blockade were not felt till 1862. Mills closed down and there was no work; by the fall of 1862, when distress was at its greatest, it was estimated that almost half the workers were unemployed and more than one-quarter employed only part time. Thereafter the restoration of the market and the increase of cotton from India and Egypt led to a gradual recovery. The famine did not bring about foreign intervention, partly because of the strong antislavery feeling among the mill operatives, and partly because it came late and was offset by news of the Emancipation Proclamation and Union victories.

COTTON GIN, a machine for separating cotton seeds from the fiber. The first successful gin was invented by Eli Whitney in 1793. The machine had a tremendous impact on American history because, by eliminating the slow hand labor formerly necessary in removing seeds from cotton, it made large-scale cotton production profitable. This in turn helped create the plantation economy of the South. Based as it was on human slavery, the South's economy contributed to the tensions that eventually precipitated the Civil War. See COTTON, *Ginning and Baling;* UNITED STATES HISTORY, *Prelude to the Irrepressible Conflict;* WHITNEY, ELI.

COTTON GRASS, a genus of grasslike sedges of the family *Cyperaceae,* which thrives in bogs throughout the Northern Hemisphere. Plants of the cotton-grass genus, *Eriophorum,* are characterized by numerous elongated, silky bristles which surround the blossoms at maturity, giving them a cottony appearance. Because of the short fibers spinning of thread from the bristles has not been practicable.

COTTONMOUTH SNAKE. See MOCCASIN.

COTTON PICKER. See FARM MACHINERY, *Cotton Picker.*

COTTONSEED, an oil-producing seed borne by the cotton plant, the source of cottonseed oil, cottonseed meal, linters, and other products of economic importance. (See COTTON.) For many years the value of the cotton crop was believed to rest solely with the lint or fiber, and the seed, separated from the lint at the gin, was allowed to rot or was dumped into nearby streams. Modern utilization of cottonseed as a source of vegetable oil developed in England and France during the early part of the nineteenth century. As early as 1829 machinery for removing the hull and extracting the oil was developed and marketed in the United States. Several mills were established but they all failed, and it was half a century later before the utilization of American cottonseed proved economically practicable.

Cotton is composed of about one-third lint and two-thirds seed by weight, each boll containing from 32 to 36 seeds. The seed, irregularly egg-shaped and hardly larger than an apple seed, is black in the Sea Island and Egyptian cottons and green in the Indian and American upland varieties. It consists of three component parts: linters, a short lint or fuzz adhering to the seed after the cotton has been ginned; the hull, the covering or skin of the seed; and the meat or kernel, the interior of the seed.

Linters. After the seed has been separated from the cotton by ginning, and cleaned, it is submitted to a second ginning process known as delinting. A device known as the "linter," similar in construction to the saw gin, removes the greater part of the linters and passes them on to the condenser, where they are formed into rolls to be baled. Linters are used as filling for mattresses and cushions, for surgical dressings, and for yarns from which twine and carpets are made. Linters yield cellulose of high purity, used in the making of explosives, rayons, plastics, photographic films, lacquers, and certain kinds of paper.

The Hulls are next loosened and detached from the kernels by a machine fitted with sets of knives or disks which split the seed. The mass of broken meats and hulls is fed into a separator which collects the hulls and permits the greater part of the kernels to pass through. Hulls are used primarily as livestock feed, serving as a roughage comparable to good grass hay.

Cottonseed Oil, extracted from the meat or kernel, is the most valuable product of the cottonseed. The meats are first run through a set of heavy iron rolls which flatten them into flakes. Three different methods are used to extract the oil: the hydraulic press, the expeller or screw press, and solvent solution. One ton of cottonseed yields about 315 pounds of crude oil, which is refined and processed further for various uses. It is used almost exclusively in edible products such as shortening, margarine, and salad and cooking oils.

Cottonseed Cake and Meal. After the oil has been expressed from cottonseed in the hydraulic press, the remainder is known as cottonseed cake. This may be broken and marketed as slab cake or ground into cottonseed meal. Cottonseed cake or meal is rich in protein and phosphorus and is used principally as a protein concentrate in livestock feeding.

Statistics. The manufacture of cottonseed products is carried on in all the large cotton-producing countries—India, Egypt, Russia, Turkey, China, Mexico, Brazil, Peru, and the United States. The last, being the largest cotton producer, has developed the most extensive cottonseed processing industry. The volume of cottonseed processed rose from 3.1 million tons in 1946–47 to 4.6 million in 1954. Cottonseed oil production in the United States was 2049 million pounds in 1953–54. World production of cottonseed was estimated at 16.7 million tons in 1953.

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COTTON STAINER is an insect belonging to the red-lung family, *Pyrrhocoridae.* The cotton stainer, *Dysdercus suturellus,* is red with black markings. It is a serious problem in southern United States, staining open bolls of cotton with reddish excrement. It also feeds upon the sap of the plant, thus weakening it and making it more vulnerable to disease.

COTTON STATE. See ALABAMA.

COTTONTAIL. See RABBIT.

COTTON WHIG. See CONSCIENCE WHIG.

COTTONWOOD is any one of several soft-wooded, rapid-growing trees belonging to the family *Salicaceae* (see POPLAR). The western cottonwood, *Poplar fremontii,* is found along the banks of streams in Texas, California, Nevada, and Utah. It grows to about 60 feet in height and the trunk is 5 to 6 feet in diameter. The tall cottonwood of the Rio Grande valley is *P. wislizenii,* which grows to a height of 80 feet. Other important cottonwood species include the southern, *P. deltoides;* the northern, *P. deltoides monilifera;* the great plains, *P. sargentii;* and the swamp, *P. heterophylla.*

COTTRELL PRECIPITATOR, an electrostatic filter for removing suspended matter from gases, developed about 1910 by Frederick G. Cottrell. Made in many forms, it was used for such applications as

removing fly ash from furnace gases and recovering valuable materials from industrial waste gases. See FILTER, AIR.

COTULLA, city, S Texas, county seat of La Salle County, near the Nueces River, on the Missouri Pacific Railroad, on U.S. Highway 81; 82 miles SW of San Antonio. Cotulla is situated in an agricultural and ranching area. Pop. (1950) 4418.

COTYLEDON, the food-digesting and food-storing structure of a seed (see SEED). Flowering plants, or angiosperms, may have either one or two cotyledons in the seed. Those plants containing one cotyledon are *monocotyledons* while those plants with two cotyledons are *dicotyledons* (see MONOCOTYLEDON; DICOTYLEDON). Seeds of evergreen, or gymnosperm, plants may have six or more cotyledons.

COUCAL is any one of several blackish brown birds of the cuckoo family, *Cuculidae*. Coucals, genus *Centropus*, are found in warmer regions of the Eastern Hemisphere and on certain islands in the southwest Pacific. They are large, ground-dwelling birds resembling magpies. The wings are rounded, the tail long. Coucals rarely fly, preferring to hop about on sturdy, thick legs or to glide from tree to tree. Their bulky round nests are located in bushes near the ground. Two to three eggs are incubated by both parents.

COUCH, SIR ARTHUR THOMAS QUILLER. See QUILLER-COUCH, SIR ARTHUR THOMAS.

COUCH GRASS. See QUACK GRASS.

COUÉ, ÉMILE, 1857-1926, French pseudo-psychologist, was born in Troyes. For many years an obscure pharmacist in his home city, Coué achieved world renown with his theory of "autosuggestion," whose touchstone was the famous self-admonition: "Every day in every way I am getting better and better." Coué maintained that constant repetition of this formula, if buttressed by faith in its efficacy, would make it come true. Coué's claim that he had cured organic disease through autosuggestion was never accepted by the medical profession, by which he was considered a pathetic quack. He wrote *Self-Mastery Through Autosuggestion* and lectured widely in support of his claims. See AUTOSUGGESTION.

COUGAR, a ferocious animal which is the second largest North American member of the cat family, ranking next to the jaguar. The cougar, *Felis concolor*, was once widely distributed from Canada to Argentina but now is found only in remote areas, particularly western United States and Canada. It is also known as mountain lion, puma, catamount, panther, and painter. This long, lithe animal measures between 6 and 8 feet in length and weighs about 160 pounds. Several subspecies of cougars vary in shade from yellowish to reddish brown above, with pale underparts. All have sharp, curved claws and long tails tipped with black. The young are generally spotted, retaining these markings until approximately six months of age. Cougars are stealthy hunters, preying upon deer and domestic animals. Despite their fierceness they shy away from man, a characteristic that has frequently, though undeservedly, earned them a reputation for cowardice. Cougars breed throughout the year. Usually three kittens are born after a 90-day gestation period. At birth the kittens are about 12 inches long and weigh about one pound. Life expectancy is about 20 years.

COUGH, a protective reflex for the elimination of obstructive or irritating material from the air passages. It starts with a quick deep inspiration followed at once by a sudden, forcible expiration while the glottis is closed. This action develops an increased pressure in the lungs, so that when the glottis suddenly opens again a blast of air is forced from the lungs through the mouth. The forced air moves the offending material upward in the air passage. The impulse that causes coughing is initiated by irritation of sensory fibers of the vagus nerve and is carried by the vagus to the respiratory center in the medulla oblongata (see LUNG). The vagus fibers usually involved are those distributed in the mucous membrane lining the respiratory tract. The cough observed in certain types of heart disease is occasioned by accumulation of fluid in the lungs as a result of weak heart action. In allergic cough, which is often productive of only small amounts of secretion, the reaction proceeds from direct effects of the responsible allergens. Sometimes irritation of the ear canal may cause a reflex cough.

Various kinds of coughs may be characteristic symptoms of diseases of the respiratory tract. In acute bronchitis the cough may be painful and may not raise any sputum. In chronic bronchitis the cough is painless and brings up large amounts of sputum. In acute pleurisy coughing is painful. Any persistent, dry, and nonproductive cough is suggestive of tuberculosis in the early stages. In advanced tuberculosis the cough is paroxysmal. When a tumor in the respiratory tract is the cause, the cough is at first dry and hacking and later brings up blood-stained sputum. A brassy cough is suggestive of severe pressure on the main bronchus or trachea. See WHOOPING COUGH.

Because cough is a symptom and not a disease, treatment is directed toward elimination of the underlying cause. In addition, drugs may be prescribed, either to suppress the cough when expectoration is not needed to rid the respiratory tract of disease products, or to increase expectoration when respiratory tract secretions must be eliminated.

Cough Medicines. The various kinds of cough may be effectively treated with a few specific drugs. The so-called "patent" cough medicines that can be bought without prescription should not be used unless recommended by the physician. Most are useless since they cannot contain enough of the prescription drugs to affect the cough reflex, although they may have a soothing effect which masks the real problem. See EXPECTORANT.

COUGHLIN, CHARLES EDWARD, 1891– , U.S. Roman Catholic priest, was born in Hamilton, Canada, of American parents. Ordained priest in 1916, he taught philosophy at Assumption College, Western University, 1916–22, and in 1926 became pastor of the Shrine of the Little Flower at Royal Oak, Mich. During 1936 Father Coughlin attracted nationwide attention with a series of radio broadcasts condemning the "New Deal." With an apparently large following, he organized the National Union for Social Justice to compete in the 1936 presidential election. Although its sponsors expected up to 10 million votes, the party, headed by Congressman William Lemke, gathered only 891,858 votes. In the early years of World War II, Father Coughlin's magazine, *Social Justice*, often denounced as demagogic, anti-Semitic, and fascistic, was barred from the mails under the espionage law; it ceased publication in 1942. Meanwhile, his ecclesiastical superiors ordered him to discontinue his radio broadcasting and other socio-political activities, which reflected his personal views, rather than those of the church.

COUGHLIN, JOHN JOSEPH, called Bathhouse John, 1860–1938, U.S. machine politician, was born in Chicago. Employed as a "rubber" in bathhouses of the city, young John's chief ambition was to have a bathhouse of his own, a goal he achieved in 1882. During these years he acquired his nickname and also his philosophy of life: "never quarrel . . . ain't much difference between the big man and the little man: one's lucky, that's all." His bathhouse was frequented by many politicians and John soon acquired political ambitions himself. He entered the city council in 1892 as alderman of the first ward, nerve center of the city, in which both the great financial houses and Chicago's most elaborate brothels and gambling places operated. Early allied with Michael "Hinky Dink" Kenna, who supplied the intelligence behind Coughlin's good-natured bluster, Coughlin was a real power in Chicago (and occasionally national) politics for decades and became wealthy on payoffs and bribes. His cele-

brated alliance with Mayor Carter Harrison (the younger) against the traction magnate Charles Yerkes, who sought control of the city's public transportation, was an alliance of convenience (see YERKES, CHARLES TYSON). Coughlin's power and influence waned after 1910 as reform elements became more effective, but for many years he remained the boisterous clown of the city council, a man often quoted in the press. Colorful and flamboyant, Coughlin was the self-proclaimed "poet lariat" of Chicago; the song *Dear Midnight of Love* (1900) and more than 50 "poems" were credited to him, although they were actually written by one John Kelley, a police reporter for a Chicago newspaper.

COULEE DAM, town, central Washington, in Grant, Douglas, and Okanogan counties, on the Columbia River, at Grand Coulee Dam; about 88 miles WNW of Spokane. Coulee Dam is a residential town for government employees and the headquarters for Coulee Dam National Recreation Area. Pop. (1950) 2500.

COULOMB, CHARLES AUGUSTIN DE, 1736–1806, French physicist, was born in Angoulême. Coulomb was an engineer in the French army for a number of years and wrote scientific papers that resulted in his election to the French Academy in 1781. He became superintendent of waters and fountains of France in 1784, but resigned after five years to devote his time to scientific research. Known for his work on friction, Coulomb invented a torsion balance for measuring the force of magnetic and electric attraction. He also invented a magnetoscope and a magnetometer and formulated Coulomb's law. During the French Revolution he was one of a committee appointed by the new government to investigate a metric system of weights and measures. The coulomb, unit of electrical charge, was named in his honor.

COULOMB is a measure of the static quantity of an electrical charge. Much as quarts measure quantity of liquids, coulombs measure quantity of electrons, one coulomb being equivalent to 6.24×10^{18} electrons. Following the same analogy, quarts per second is a measure of the rate of flow of a liquid, and coulombs per second is a measure of the rate of flow of electrons. One coulomb passing a point in one second is called an ampere. See ELECTROSTATICS; ELECTRICAL AND MAGNETIC UNITS; COULOMB, CHARLES.

COULSDON AND PURLEY, urban district, SE England, in NE Surrey, 13 miles S of London. Included within the urban district are the towns of Coulsdon, Purley, Woodcote, Kenley, and Sanderstead. Primarily residential, the area forms part of the outer suburban fringe of Greater London. Pop. (1951) 63,770.

COULTER, JOHN MERLE, 1851–1928, U.S. botanist, was born in Ningpo, China, of missionary parents. Educated at Hanover College and Indiana University, Coulter was botanist for a geological survey in Montana and Wyoming, 1872. He was president of Indiana University, 1891–93, and of Lake Forest College until 1896, when he became professor of botany at the University of Chicago. One of the country's foremost botanists, Coulter was founder, 1875, and for many years the editor of the *Botanical Gazette*. His works include *Manual of the Botany of the Rocky Mountain Region* (1885), *Plant Relations* (1899), and *Plant Genetics* (1918). He edited the sixth edition (1890) of Asa Gray's *Manual of Botany* (1848).

COUMARIN is a fragrant essential oil that occurs in several species of clover and sweet-scented grasses, in tonka beans, and in various other plants. (See ESSENTIAL OIL.) A colorless, crystalline substance, it smells much like vanilla, for which it is sometimes used as a substitute. It is also used in the manufacture of perfumes, as a scent for snuff, and as a flavoring for wines and for Swiss cheese. It was once employed in medicine but has become important for its derivatives: dicoumarin, an anticoagulant, and warfarin, a rodenticide. See RAT POISON.

Coumarin gives yellow sweet clover (melilot) its characteristic pleasant odor. Sweet clover that is spoiled or improperly cured is poisonous and causes sweet clover disease in cattle. Affected cattle bleed profusely from bruises or slight injuries because the clotting power of the blood has been destroyed. Studies of sweet clover to find the ingredient responsible resulted in the isolation of dicoumarin.

Dicoumarin delays or prevents coagulation of blood by acting on the prothrombin-producing mechanism of the liver. Prothrombin is one of the substances essential to blood clotting (see LIVER, *Blood;* BLOOD CLOTTING). Dicoumarin interferes with formation of prothrombin and gradually diminishes the concentration of it in the blood. Dicoumarin has been notably successful in treating thrombosis and in preventing the formation of blood clots following injuries, surgical operations, or infections (see THROMBOSIS AND EMBOLISM). Because hemorrhage may follow administration of dicoumarin, patients taking this drug need close medical supervision. If bleeding develops, blood transfusions to supply the missing prothrombin must be administered until the hemorrhage is controlled. Large doses of synthetic vitamin K preparations, which increase production of prothrombin by the liver, may also be given. See VITAMIN K.

Dicoumarin is slower to act than other anticoagulants but its effects last a week or more. It may be combined with heparin, a quick-acting anticoagulant, so that the advantages of both types of anticoagulants may be realized (see HEPARIN). Dicoumarin is the least expensive and most readily available of all drugs that interfere with blood coagulation.

Coumarin ($C_9H_6O_2$) is a close relative of cinnamic and salicylic acids. It is slightly soluble in water but dissolves readily in alkalies. Both coumarin and dicoumarin have been prepared synthetically in chemical laboratories. THEODORE KOPPANYI

COUNCIL, COUNTY. See LOCAL GOVERNMENT.

COUNCIL, ECCLESIASTICAL. See ECCLESIASTICAL COUNCIL.

COUNCIL, VATICAN. See VATICAN COUNCIL.

COUNCIL BLUFFS, city, SW Iowa, county seat of Pottawattamie County, on the left bank of the Missouri River, the Burlington, the Great Western, the Illinois Central, the Milwaukee, the Chicago and North Western, the Rock Island, the Union Pacific, and the Wabash railroads, and U.S. highways 6, 30A, 75, and 275; across the Missouri River from Omaha, Neb., and 117 miles WSW of Des Moines. Location on a natural river crossing caused Council Bluffs to develop as a focal point for transportation, industry, and agriculture. The city has railroad repair shops and roundhouses, grain elevators, stockyards, and food processing plants. Manufactures include agricultural implements, livestock feed, railway equipment, automotive and electrical equipment, plastics, and furniture. There are extensive plant nurseries. In 1804 Lewis and Clark held a council with the Indians near the site of the city. In the 1820s it was the site of a fur-trading post and was for a time known as Hart's Bluff. The Mormons arrived in 1846 and changed the name first to Miller's Hollow and later to Kanesville. During the Gold Rush of 1849 Kanesville was a stopping place and outfitting point for travelers to the West. In 1853 the name of the city was changed to Council Bluffs. In 1863 the city was chosen as the eastern terminus of the Union Pacific Railroad. A 56-foot concrete replica of the golden railroad spike driven at Promontory Point, Utah, in 1869, commemorating the spanning of the continent with rails, and a Lewis and Clark monument are among several memorials to the opening of the frontier. Lake Manawa State Park is 3 miles south. Pop. (1950) 45,429.

COUNCIL FOR NEW ENGLAND, a corporation of 40 men, largely from the nobility and gentry, chartered by King James I of England in 1620 with the right to colonize from north latitude 40° to 48°, and from sea to sea, with rights over the fisheries and

trade of the area. The council resulted from a reorganization of the Plymouth Company, or branch of the Virginia Company (see PLYMOUTH COMPANY), and expected to establish landed estates in the New World. Sir Ferdinando Gorges was the president and leading figure of the council. His son Robert was sent in 1623 to establish a colony and serve as governor, but the effort failed. It was from the Council of New England that the Pilgrims obtained a patent in 1621, after their landing at Plymouth, and thus received a legal right to settle. The council also granted a patent in 1628 to the group which formed the Massachusetts Bay Company, but in the next year that group obtained a royal charter which made them independent of the council. (See MASSACHUSETTS BAY COMPANY.) The council opposed the Massachusetts Bay charter and, in the effort to strengthen its position and reorganize, surrendered its own charter in 1635. The civil war in England prevented any revival of the council, or further activity, except for a grant of Maine to Gorges. See GORGES, SIR FERDINANDO.

COUNCIL GROVE, city, E central Kansas, county seat of Morris County, on the Neosho River, the Missouri Pacific and the Missouri-Kansas-Texas railroads, and U.S. Highway 50N; and 50 miles SW of Topeka. The area produces livestock, poultry, wheat, and corn. Council Grove was the site of a treaty with the Osage Indians in 1825. Pop. (1950) 2722.

COUNCIL-MANAGER GOVERNMENT. See CITY GOVERNMENT, *City-Manager or Council-Manager Plan.*

COUNCIL OF APPOINTMENT, a body created by the New York State constitution of 1777, consisting of the governor and four senators, elected annually by the general assembly. Most state and local officials were appointed by the council, which became extremely important in factional politics. It was abolished by the 1821 constitutional convention.

COUNCIL OF BASEL, a general council of the Roman Catholic church held at Basel, Switzerland, 1431–49. The council was summoned by Pope Martin V, who died before the meeting. The new pope, Eugenius IV, confirmed the convocation but soon found himself involved in rivalry with the council, which declared its supremacy over the pope. At first Eugenius had to compromise and accept certain church reforms made by the council, but in 1437 he ordered the dissolution of the meeting, thus making it heretical. A new council was summoned to meet at Ferrara (see COUNCIL OF FERRARA-FLORENCE). The Council of Basel ordered the suspension of Eugenius and in 1439 introduced a schism in the church by choosing a rival pope, who took the name of Felix V. Eventually Eugenius gained the upper hand and the council was discredited. Eugenius died in 1447 and was succeeded by Nicholas V. Felix V abdicated in 1449 and later that year the council dissolved itself, thus leaving the pope supreme in the church.

COUNCIL OF CENSORS, a body established by the 1776 constitution of Pennsylvania, elected for seven years, with power to inquire into the efficiency of the government and to propose constitutional amendments. The Pennsylvania council was abolished in 1790. A similar body, formed by the Vermont constitution of 1777, functioned until 1869.

COUNCIL OF CHALCEDON, the fourth ecumenical council of the Catholic church, held in 451 at Chalcedon near Constantinople. The council was called by the Emperor Marcian to annul the decrees of the "Robber Synod" (449), which had confirmed the Eutychian doctrine that the human nature of Christ was absorbed in his divinity. (See EUTYCHES.) The Council of Chalcedon annulled the decrees of the Robber Synod, deposed the Eutychian leaders, and reaffirmed the two natures (divine and human) in Christ. Jesus Christ was declared to be true God and true man, each nature being perfect in itself and each distinct from the other, yet perfectly united in one person. The Eutychian party was destroyed, but the Copts and Monophysites withdrew from the church. See COPT; MONOPHYSITE.

COUNCIL OF CONSTANCE, a general council of the Roman Catholic church held at Constance, Switzerland, from 1414 to 1418. The objectives of the council were threefold: to end the Great Schism which had split the church since 1378, to deal with John Huss and his followers, and to devise reforms for the church. The council was proposed by Emperor Sigismund and was summoned by John XXIII, one of the three rival popes. Dominated by theologians holding the conciliar theory of church authority, the council declared itself the supreme power in the church. After considerable difficulty the rival popes, John XXIII, Gregory XII (since recognized as the canonical pope), and Benedict XIII, were deposed or forced to abdicate. The Great Schism ended in 1417 with the election of a new pope, Martin V. The other major action of the council was the condemnation of John Huss and Jerome of Prague; both men were burned at the stake, but the Hussite heresy was too strong to be easily stamped out. The council adopted a few church reforms, the most important of which dealt with taxation and fiscal administration. A plan was adopted providing for periodic councils to govern the church. See PAPACY, *Western Schism;* HUSS, JOHN; HUSSITES.

COUNCIL OF ECONOMIC ADVISERS, a group of three members in the executive office of the President of the United States who advise him on economic developments and policies. The council was established by Congress in the Employment Act of 1946. The advisers analyze the national economy, appraise federal government economic programs and policies, and recommend to the president policies for economic growth and stability. Under his direction the council prepares the economic report of the president to Congress at the beginning of each session. The members are appointed by the president with the advice and consent of the Senate, and the chairman is designated by the president.

COUNCIL OF EPHESUS, 431, the third ecumenical council of the Catholic church, was convened by the two emperors, Theodosius II and Valentinian III, to deal with the controversy over the nature of Christ. The controversy arose because of the teachings of Nestorius, the patriarch of Constantinople, who drew a sharp distinction between the divine and human natures of Christ. There was also rivalry between Nestorius and Cyril, the patriarch of Alexandria. After the council met factionalism broke out, resulting in the condemnation first of Nestorius and later of Cyril. Finally Theodosius intervened and brought about the deposition of Nestorius, whom he had previously supported. The council condemned the views of Nestorius and affirmed the unity of the godhead and the manhood in Christ. (See CYRIL OF ALEXANDRIA, SAINT; NESTORIANS.) In 449 another church council met at Ephesus but this so-called Robber Synod is regarded as uncanonical. See COUNCIL OF CHALCEDON; EUTYCHES.

COUNCIL OF FERRARA-FLORENCE, 1438–45, a general council of the Roman Catholic church summoned by Pope Eugenius IV to end the schism between East and West. In 1437 after ordering the dissolution of the Council of Basel (see COUNCIL OF BASEL) the pope called a new council, which met first at Ferrara but removed to Florence in 1439 because of the outbreak of the plague. The project for church union was promoted by John VIII, the Byzantine emperor, and was supported by the patriarch of Constantinople and the head of the Russian church. The chief issues were soon settled: the Greeks agreed that the Roman church might use the disputed *filioque* clause in the Nicene Creed and might use unleavened bread in the Mass; they assented to the Western view of purgatory; and they accepted papal supremacy over the Eastern patriarchs. In 1439 Eugenius issued a bull proclaiming the union of the

Roman and Orthodox churches. The project was stalled, however, by opposition in the Eastern church, and the plan was nullified by the fall of Constantinople to the Turks in 1453. The council continued in session until 1445 to negotiate with the non-Orthodox Eastern churches, and it succeeded in bringing several small groups into the Roman communion.

COUNCIL OF FIVE HUNDRED, the body of citizens at Athens, which prepared and summoned the popular assembly, and had considerable jurisdiction over finances and daily administration. Cleisthenes, in his reforms of 507 B.C., established it in place of the earlier smaller council. He divided the population into 10 tribes or *phylae*, each of which chose 50 members to serve for a year, distributed according to population among the wards or *demes*. Citizens who were more than 30 years old were eligible for the council, but no one could serve for more than two terms. In France, under the Directory, 1795–99, one of the houses of the legislature was called the Council of Five Hundred (see DIRECTORY).

COUNCIL OF PISA, 1409, an uncanonical council of the Roman Catholic church called to end the Great Schism that had split the church since 1378. The council was called by a group of cardinals, who hoped to depose the two rival popes, Gregory XII at Rome and Benedict XIII at Avignon, France. The council declared the two popes heretical and schismatic and deposed them from their offices; it then elected a new pope, who took the name of Alexander V. The rival popes, however, refused to abdicate, and the outcome was the addition of a third pope in the Great Schism. The split was finally settled by the Council of Constance. See COUNCIL OF CONSTANCE; PAPACY.

COUNCIL OF REVISION, a body established by the 1777 state constitution of New York, composed of the governor, the chancellor, and the supreme court judges. Vetoes were enacted by majority of the council, but could be overridden by a two-thirds vote of the legislature. The 1821 constitution abolished the council and gave the governor the veto. The Illinois state constitution of 1818 created a similar Council of Revision (probably copied from New York) which functioned until 1848.

COUNCIL OF TEN, in the Venetian Republic, an important secret executive body. Founded in the fourteenth century as a temporary committee to discover and deal with conspiracies, the Council of Ten became permanent, and developed financial and military departments as well. See VENICE, *History*.

COUNCIL OF THE INDIES, officially the Royal and Supreme Council of the Indies, the principal agency through which the kings of Spain governed their overseas possessions. Growing out of earlier committees, it was established as a separate council in 1524. Subject to the royal authority, the council had legislative, judicial, and especially administrative and supervisory powers throughout the period of Spanish colonial rule in the Americas.

COUNCIL OF TRENT, the nineteenth and most important of the ecumenical councils of the Roman Catholic church, convened in three sessions, 1545–47, 1551–52, and 1562–63. The Protestant Reformation forced the Catholic church to define its doctrines and to undertake the ecclesiastical reforms that had long been debated. When Paul III became pope in 1534 he made plans for a general council, which was summoned and postponed several times before it finally convened on Dec. 13, 1545, at Trent, Italy. No Protestant delegates were present. Dogmatic decisions were made regarding divine tradition and the Holy Bible; the Vulgate was declared the authoritative edition of the Scriptures with the Roman Catholic church as its interpreter. Definitions were made of original sin, justification, and the sacraments, especially confirmation and baptism. In March 1547 the council removed to Bologna to escape the plague, and soon thereafter it adjourned.

The second session began on May 1, 1551, at the call of Pope Julius III. This session was marked by the presence of some Protestant delegates and by the prominence of the several Jesuits. There was discussion of penance, extreme unction, the Eucharist, benefices, church jurisdiction, and the discipline of the clergy. No agreement was possible with the Protestants. The session adjourned in April 1552 because of a military reverse suffered by Charles V in his war with the Protestants.

The third session began on Jan. 18, 1562, at the call of Pius IV. Doctrinal decisions were made on the Eucharist (see EUCHARIST; TRANSUBSTANTIATION), the liturgy of the Mass, the sacramental nature of matrimony and holy orders, the veneration of the saints, the use of images, and the granting of indulgences; other decrees provided for reforms in the preparation and discipline of the clergy, and for such measures as the compilation of a catalogue of forbidden books, and the publishing of a catechism and a conspectus of the articles of faith. The council ended on Dec. 4, 1563. The council's decrees were approved by all Catholic sovereigns, except the rulers of Spain and France, who refused to recognize any decision that hindered the royal privilege or restricted the freedom of their subjects. The reforms made by the council purified the church of many abuses and furthered the Catholic reformation, which had already begun (see COUNTER REFORMATION). Papal supremacy was recognized, and the church was greatly strengthened for its struggle with Protestantism. See REFORMATION; ROMAN CATHOLIC CHURCH, History, *Modern Period*.

COUNCIL OF VIENNE, 1311–12, the fifteenth ecumenical council of the Roman Catholic church, held at Vienne, France. The council was promoted by Philip IV of France and was called by Clement V, a French pope who had transferred the papal court from Rome to Avignon. Philip demanded the calling of a council to abolish the wealthy and powerful order of Knights Templar. Meeting under the presidency of Clement, the council debated the problem at some length without taking final action, but at last it agreed that the pope should abolish the Templars by an administrative ruling. The action was then taken by a papal bull. A few other decisions were made, including one for the abolition of the Beghards. See AVIGNON; BEGHARD; CLEMENT V; PHILIP IV; TEMPLARS; ECCLESIASTICAL COUNCIL.

COUNCILS, LATERAN. See LATERAN COUNCILS.

COUNCILS OF CONSTANTINOPLE, four ecumenical church councils held at Constantinople, the capital of the Byzantine Empire and the seat of the Eastern Orthodox church.

The First Council of Constantinople (the second ecumenical council) was held in 381 at the call of Emperor Theodosius I. No representatives of the Western church were present, but the Roman popes later accepted the council as ecumenical. The council reinstated Gregory of Nazianzus as patriarch of Constantinople, and later it appointed his successor; it confirmed the dogmas of the Council of Nicaea (325) and denounced all opposing doctrines; it condemned Arianism and other current heresies. See COUNCILS OF NICAEA; ARIANISM.

The Second Council (the fifth ecumenical council) met in 553 at the call of Emperor Justinian. Under Justinian's domination the council condemned certain writings (the "Three Chapters"), excommunicated Pope Vigilius, and set forth the Orthodox faith. The Roman church first rejected the decisions but later it accepted the council as ecumenical.

The Third Council (the eighth ecumenical council) was convoked in 680 by Emperor Constantine IV. This council confirmed the doctrine of the human and divine will in Christ and condemned as heretical the opposite Monotheletic view that His divine and human natures are united in a common will. See MONOTHELETISM.

The Fourth Council (the eighth ecumenical council of the Roman Catholic church) met in 869–70 at the suggestion of Emperor Basil I. Photius, the patriarch of Constantinople, was condemned as a usurper, and Ignatius, the former patriarch, was restored to the office. This council, which was never recognized as ecumenical by the Eastern Orthodox church, deepened the division between East and West. See Ignatius of Constantinople, Saint; Photius.

COUNCILS OF LYONS, the thirteenth and fourteenth ecumenical councils of the Roman Catholic church which met at Lyons, France.

The First Council of Lyons met in 1245 at the call of Pope Innocent IV. Frederick II of the Holy Roman Empire was excommunicated, and a vain attempt was made to dethrone him on the charges of heresy, sacrilege, and other crimes. The council also voted measures to aid the Crusaders in the Holy Land and to support the Latin Empire at Constantinople. See Innocent IV; Frederick II; Crusades.

The Second Council of Lyons was convoked in 1274 by Pope Gregory X to promote the Crusades, to unite the Orthodox and Roman churches, and to reform the church. The *filioque* clause in the Nicene Creed, which had long divided the two churches, was defined by a declaration that the Holy Spirit proceeded from the Father *and* the Son, and not from the Father *through* the Son, as the East had held. The union of the two churches was proclaimed, but the merger was unpopular in the East and could not be consummated. The most important measure of church reform was a decree providing for the election of popes by a conclave (see Conclave). The pope's efforts to promote a new crusade came to naught.

COUNCILS OF NICAEA, the first and seventh ecumenical councils of the Roman Catholic and Eastern Orthodox churches which met at Nicaea in Asia Minor.

The First Council of Nicaea was convened in 325 by Constantine the Great to settle the doctrinal disputes within the Christian church just then emerging from persecution. The conflicting doctrines were represented by Arius and Athanasius, both of whom took prominent roles in the council. The emperor was present and exercised a strong influence on the decisions. The council quickly condemned Arius, who held that in the Trinity the Son is different in nature from the Father. After much discussion a compromise was reached declaring that the Son is of one substance with the Father. Arius was banished and Arianism was declared heretical. The council granted patriarchal authority to the bishop of Alexandria and it attempted to fix the date of Easter. (See Arius; Athanasius, Saint.) Significant because it took positive instead of defensive action in behalf of the church, this first ecumenical council became a model for those which followed.

The Second Council of Nicaea met in 787 at the call of Empress Irene. The council ordered the restoration of images in the churches but it declared they should be venerated, not worshiped. Only a few Western delegates were present but the popes recognized the council. See Iconoclast.

COUNSELING. See Psychology; Child Welfare; Handicapped; Individual Psychology; Personality; Psychoanalysis; Education, Educational Psychology; Business Psychology; Industrial Psychology; Vocational Guidance; Applied Psychology; Psychiatry; Psychotherapy; Juvenile Delinquency; Educational Testing.

COUNSELOR or **COUNSELLOR** is a lawyer in the United States who renders legal advice and drafts legal documents in a law office, as distinguished from an attorney, who pleads cases in court. Counselor and attorney correspond to the British "solicitor" and "barrister," respectively. The work of the counselor is considered more learned than that of the attorney. Most lawyers in the United States practice law as both counselors and attorneys. A counselor may also be a lawyer who specializes in extensive legal research and the writing of briefs and legal memoranda for law firms and other individual lawyers. In large cities some lawyers specialize as either counselors or attorneys.

COUNT, a title derived from the Latin *comes* and corresponding to the French *comte*, Italian *conte*, and German *graf*.

In the early Roman Empire, *comes* denoted the attendants or followers of the emperor; by the fifth century this designation had developed into a formal title of high imperial officials. In early France the title was bestowed by the king upon the governors of the administrative subdivisions of the kingdom. With the transition to feudalism the official counts evolved into feudal vassals almost independent from the sovereign; the title gradually lost its official capacity and became territorial and hereditary. In Germany the transition from official to territorial and hereditary counts resembled that in France. The territorial counts (landgraves) concentrated in their hands considerable military, judicial, and administrative authority, being in immediate relationship to the emperor. By the beginning of the nineteenth century, especially after dissolution of the Holy Roman Empire, the territorial counts had been mediatized, that is, deprived of their sovereign status and placed under authority of other sovereigns. Later the title lost its political significance and became merely honorary. In countries where it was generally heritable by all male descendants, multiplication of counts detracted somewhat from its original dignity.

The title of count was never adopted in the English peerage, its equivalent being that of "earl," though countess is the title borne by the wife of an earl. It survived, however, in the name of a basic territorial unit in England—county—which was also adopted in America.

COUNTER, RADIATION. See Atomic Energy, *Detecting Devices*.

COUNTER ELECTROMOTIVE FORCE. See Electrodynamics.

COUNTERFEITING, the coining or printing of money unlawfully. The right to coin or make money is reserved to the government under the laws of all nations. However, a government may empower a bank to issue "script" money, virtually demand notes payable by the bank, and allow it to circulate as money. Provisions in various countries, particularly in the United States and the United Kingdom, prohibiting the making of money by all others than the proper government officials, are very comprehensive. They include the prohibition of making or being concerned in the making of money from any substance and by any process in similitude of genuine money in current circulation; the mutilation or lightening of genuine coin; the making of dies, molds, or other implements or machinery designed to make money; and the possession of such implements or of counterfeit money with knowledge of that fact and with intent to defraud the government or individuals. Counterfeiting of postage stamps, government bonds, and other governmental documents is prohibited. The acts are punishable by fine and imprisonment, the maximum penalty in the United States being 15 years' imprisonment and $5000 fine. In the United Kingdom counterfeiting was formerly treason, but now by statute it is felony and punishable by imprisonment.

Counterfeiting in the United States has been a serious problem since Revolutionary times, when in 1776 Continental currency was undermined by counterfeits circulated by enemies. The volume of bogus money seized by the U.S. Secret Service of the Treasury Department reached a peak of nearly $1.5 million a year during the 1930s. An active campaign reduced the total to $46,000 a year by the end of World War II. The number of persons cheated by counterfeiters dropped 97 per cent, from 102,800 a year during

1933–36 to 2877 in 1943. During the postwar years the volume of counterfeited money seized in the United States showed considerable increase, amounting to more than $294,121 in 1953 and $355,299 in 1954; similar increase was reported in counterfeited checks and government bonds.

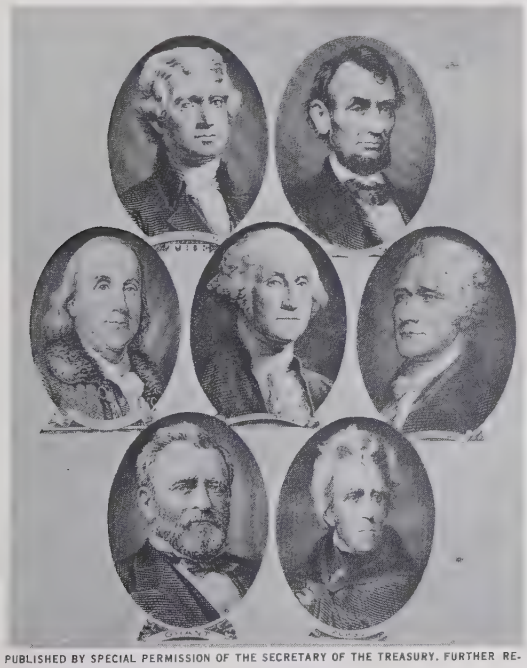
To safeguard genuine money, bills are made under unique processes by firms restricted to the government contract. The intricate engraving is produced by expert craftsmen, limited to one part of the work, at the Bureau of Engraving and Printing in Washington, D.C.

Detection. Comparison of counterfeit bills with genuine ones exposes the poor quality of the acid-etched lines of the bogus when matched with the master steel engraving of the original. The genuine portrait stands out distinctly, with lifelike eyes, from the background of finely screened lines. The saw-toothed points on the rim of the colored seal are even and sharp; series numbers are firmly and evenly printed. Genuine bills are printed on distinctive paper containing very small red and blue threads. Rubbing ink off a bill will not prove that it is genuine or counterfeit, as commonly thought, since ink can be rubbed from good as well as bad bills. Bogus coins can be detected by their dull sound when dropped, a greasy feel to the touch, their irregular outer edge or milling, and their softness. When tested with a nitric acid, silver nitrate, and distilled water solution, genuine silver coins will not discolor.

Precautions suggested by the Secret Service to persons who have received counterfeit money are to delay the passer of the counterfeit money and to notify the police. A description of the person passing the money, and any other pertinent details, such as the license number of any car used by him, should be noted if the passer cannot be detained. Federal laws provide that any person having knowledge of counterfeiting who does not at once make such knowledge known to the authorities can be fined $500 and imprisoned for three years.

Penalties. Counterfeiting in the United States is a felony. Under the U.S. Criminal Code as amended in 1944, anyone who conspires to make counterfeit bills or other obligations is liable to the same punishment as one who produces the counterfeit. Making counterfeit gold or silver coins of the United States or a foreign country is punishable by a maximum fine of $5000 or 15 years in prison or both, passing same is punishable by a maximum fine of $3000 or five years in prison, and the counterfeiting or passing of minor coins by a fine of $1000 and imprisonment up to three years. The unlawful use of tokens or slugs similar to any U.S. coin is also punishable. Under the federal laws, a person who has received counterfeit bills and fails or refuses to surrender them to an authorized agent of the Treasury Department may receive a maximum fine of $100 or a year's imprisonment, or both. All banking institutions are empowered as authorized agents to confiscate counterfeit money to be surrendered to the Secret Service.

Enlarged sections of counterfeit, lower left, and genuine one dollar bill emphasize differences in detail. Spurious bill is characterized by fuzziness and lack of definition.



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These are the portraits that always appear on U.S. paper money—Washington on $1 bills; Jefferson, $2; Lincoln, $5; Hamilton, $10; Jackson, $20; Grant, $50; Franklin, $100.

COUNTERIRRITANT, a drug applied externally to relieve congestion, pain, or discomfort in one part of the body by stimulating or irritating another. For example, scratching one area of the skin relieves itching in neighboring areas; thus one type of irritation offsets another. Skin irritants include volatile oils, camphor, ammonia, cantharides, ether, and chloroform; physical measures such as heat may also prove irritating. Counterirritants cause reactions of varying severity—redness, warmth, swelling, and even pain. All of these reactions indicate that there is an increase in the caliber of the blood vessels in the irritated portion of the skin.

On the basis of the degree of inflammation they cause, counterirritants are classified as rubefacients, vesicants, and pustulants. Rubefacients cause increased redness and heat of the skin surface by dilating the superficial blood vessels. Vesicants act to continue the dilation of the vessels until plasma escapes into the intracellular spaces and blisters form. Pustulants penetrate the openings of the skin glands to cause many small abscesses. The degree of inflammation produced by an irritant depends not only on the type of irritant used, but also on the concentration and duration of exposure. Irritants are usually applied in the form of plasters, hot fomentations or

poultices, and liniments. See RUBEFACIENTS; VESICANTS.

COUNTERPOINT, in music, the sounding together of two or more individual melodic voices (also called lines and parts). To hear music contrapuntally is to follow attentively two or more melodic lines at the same time. The more these strands of melody possess the qualities of independence and individuality, the more contrapuntal their relationship is said to be. "Independence" suggests a certain disagreement (and tension) between parts, and this would appear to be implied in the Latin *punctus contra punctum* (note against note) from which counterpoint is derived. *Polyphonic* (many-voiced) is also music that is contrapuntal in texture. All music contains, in some degree, both contrapuntal and harmonic elements, except, of course, music consisting of a single unaccompanied melody (see HARMONY). When the predominant impression upon the listener is one of a "texture" of interwoven strands of melody, the style is said to be contrapuntal. When this quality is present only in very slight degree, the style is harmonic or "homophonic." Counterpoint is usually described as being two-part, three-part, four-part, and so forth. The expressions "double counterpoint" and "triple counterpoint" refer to inverted counterpoint, which is composed in such a way that the vertical order of the parts can be rearranged at will; the bass voice can become the soprano, the soprano the bass. Hence, in "triple counterpoint," as distinct from "three-part counterpoint," the three voices can be interchanged, each with either of the two others.

Independence of each of the voices from the others depends upon several factors, of which the most important is rhythm. In contrapuntal music the interwoven strands of melody will seldom express identical rhythmic patterns at the same moment. The strong accents of the voices will not coincide, and as a result the ear will be attracted first to one voice, then to another. One part may be given short notes while another has longer ones, creating a contrast in melodic activity. The melodic curves, the "ups-and-downs" of the melodies, will not be of the same "shape"; there will be much contrary motion (one voice moving up while another moves down), and the peaks or climaxes of the separate curves will be found at different points. Independence is heightened also by harmonic disagreement—that is, the occurrence of dissonant intervals, such as seconds or sevenths among the melodic lines (see INTERVAL). In some cases the two melodies are written in different keys, producing a tension between the opposing tonalities which traditionally was resolved, but which some modern composers employ as an end in itself.

These elements of independence are balanced by factors of agreement, and the interplay of these opposing principles plays an extremely important role in determining the particular style of the music. One does not exist without the other, but their relative dominance is always changing. Factors of agreement will be in the ascendancy when there is coincidence of rhythmic patterns and accents, when similarity exists in melodic motion and melodic curves, and when dissonant intervals are resolved into consonant ones. Also important in this connection is the use of imitation—the appearance of the same thematic ideas in both voices.

Counterpoint and Harmony Compared. Counterpoint and harmony are two aspects of musical texture. While it is essential to distinguish the nature and effect of these aspects, it should be realized that they interact and overlap in virtually all music. In melody, the tones are heard in succession, and so it is called the horizontal aspect (since occidental music happens to be printed in that way) as distinct at least in theory from the vertical aspect, which is largely harmonic (see TONE). Harmony is applied traditionally to chords that have been formed by superposing intervals of a third. But counterpoint also creates harmony, since at any given moment the listener hears the total effect of a combination of tones sounding together. This is an important source of many new chords (see CHORD). On the other hand, certain elements of counterpoint are usually present when vertical chords are heard in succession, since the listener's ear follows the horizontal progression of tones from one chord to the next, a process called voice-leading. Tones foreign to the chords against which they sound are contrapuntal tones, as opposed to chord tones, or harmony notes. They are also commonly called nonharmonic tones.

Counterpoint in Music History. Attitudes in regard to the desirable balance between harmonic and contrapuntal elements in musical style have varied greatly from composer to composer and from period to period in the history of music. The latter half of the sixteenth century is often called the Golden Age of Counterpoint, as exemplified in the music of Palestrina. His was music of great flexibility and nobility, in modal vocal counterpoint, disciplined by rather strict rules (see MODE; SCALE). The counterpoint of the great baroque period of the eighteenth century was of a contrasting type (instrumental, rhythmic, harmonic, and tonal) summed up excellently in the works of Bach (see BACH, JOHANN SEBASTIAN). The fugue, as perfected by Bach, is regarded as the ideal contrapuntal form, concerned as it is primarily with evolving melodic lines; paradoxically, however, the fugues of Bach invariably exhibit the highest degree of harmonic organization (see FUGUE). Composers of the nineteenth century were in general more interested in the expressive possibilities of harmony than in counterpoint. In the music of this period, seemingly contrapuntal textures often prove on closer acquaintance to deserve the epithet "animated harmony," and the listener's impression is that the chords came first and were then given melodic embellishment in the voice-leading. Chromatic progressions in melodic lines, introduced for coloristic and expressive purposes, led to a somewhat sinuous type of counterpoint. The twentieth century has seen a return to the past as well as the most advanced experimental developments; virtually every conceivable style of contrapuntal writing has been used by one twentieth century composer or another. Much of this renewed interest in counterpoint was in reaction against the previous century's overemphasis of harmony. Modern composers speak of "linear writing" and "pure counterpoint" to indicate their desire to produce music having little or no reference to harmony. This aim could be (and was) achieved in the thirteenth century, when it was the custom to *hear* contrapuntally; but in the twentieth century such an objective would be hard to achieve, since it would require listeners to disregard entirely the musical meanings that combinations of tones have acquired through centuries of use.

WALTER PISTON

COUNTER REFORMATION, the reform movement within the Roman Catholic church in the sixteenth century and the countermovement against Protestantism. Since the late fourteenth century there had been complaints about church abuses, and frequent demands for reforms had been made. These abuses gave rise to the Protestant revolt, which was led by Martin Luther (see LUTHER, MARTIN; REFORMATION). The Catholic reform movement began with the Oratory of Divine Love, a little group of clergy and laymen founded at Genoa in 1497; and gradually a new spirit began to appear among the common people and to extend into the church hierarchy. Paul III, who became pope in 1534, was a strong advocate of reform, and he had the support of Emperor Charles V. The Society of Jesus, organized in 1540 by St. Ignatius of Loyola, was a powerful force for reform (see JESUITS; IGNATIUS OF LOYOLA, SAINT). The Council of Trent (1545–63) swept away the abuses in the church, defined Catholic doctrines, regulated education and the training of the clergy,

approved an index of prohibited books, and required every Catholic to recognize the Tridentine profession of faith.

Paul IV, who held the papal power from 1555 to 1559, drove the Renaissance paganism from the Roman papacy, cleansed and purified the city of Rome and the papal court, and set a pattern of austerity that later popes did not dare to break. Pius V (1566–72) enforced the decrees of the Council of Trent and gave reality to the reforms that had been approved; it is said that under him Rome was transformed into one large monastery. The spirit of reform swept over the whole church. Priests and prelates were devout men worthy of their holy calling; learning and culture were devoted and disciplined; art was chaste and austere, and was devoted to a religious purpose; poetry and music were used to glorify God and to serve the church. Many new religious orders were founded. There was a great flowering of mystics and saints, who served their church in every field of activity—in preaching and teaching, in evangelism and missions, in statesmanship and administration. This religious reformation varied somewhat from country to country. It began in Spain shortly before 1500 under the leadership of Francisco Ximénez, and during the early period of Spanish colonization it developed into a great missionary crusade. In France, however, the movement had to await the end of the bitter religious wars, and it did not reach its fullness until after 1625.

The countermovement against Protestantism began about 1560. In Germany many areas were won back to the church. In Poland the Protestant sects were crushed. In Bohemia dissent was largely suppressed. In France the Huguenots were subjected to persecution and massacre but were able to survive (see Huguenot). In England and Scotland the Counter Reformation provoked an upsurge of nationalism, which reacted against Catholicism. The Inquisition was employed to repress dissent but its greatest use was in lands where Protestantism was weak, especially in Spain where Philip II, the champion of the church, pursued policies sometimes embarrassing to the papacy (see Inquisition). As the military arm of the Counter Reformation Philip II met disaster in his attempted invasion of England (see Armada), and his oppressive policy in the Netherlands caused a revolt, resulting finally in independence for the northern provinces, which were largely Protestant. The Counter Reformation culminated in the Thirty Years' War (1618–48); this struggle ended in a military stalemate that stabilized the religious boundaries of Europe. See Thirty Years' War.

COUNTERREVOLUTION. See Revolution.

COUNTS, GEORGE SYLVESTER, 1889– , U.S. educator, was born near Baldwin City, Kan., and studied at Baker University and the University of Chicago. In 1916 he began his work in teacher training and in 1927 became professor of education at Columbia University. He was a member of the Educational Policies Commission of the National Education Association, 1936–42, president of the American Federation of Teachers, 1939–42, and New York state chairman of the American Labor party, 1942–44. Counts was a founder of the educational magazine, *Social Frontiers*, in 1934, and wrote *The Education of Free Men in American Democracy* (1941) and other works.

COUNTY is a unit of local government in the United States, certain Canadian provinces, and the United Kingdom, combining administrative, judicial, and political functions.

In the United States there are approximately 3000 counties of various size, population, and political significance. County organization is less important, however, in the New England states and Louisiana, where the principal units of local government are townships and parishes, respectively. Counties are creatures and instrumentalities of the states for the enforcement of state laws and the performance of such functions as may be delegated to them by the states; however, state constitutions protect counties from an arbitrary abolition or loss of territory.

The county administration is headed by a county board, usually an elective body with little legislative power but considerable administrative discretion. The two main types of county boards are a board of commissioners of three to five members, prevalent in about 70 per cent of all counties, and a much larger board of supervisors, often having 40 to 50 members. The powers of a county board usually include the custody of county property, the appointment and removal of some county officials, the licensing of certain trades and occupations, the maintenance of highways and bridges, the organizing of townships and other county subdivisions, county poor relief, and the organizing and supervising of elections.

In Canada systems of local government vary in individual provinces, which have exclusive jurisdiction over municipal affairs. Counties are basic units of local government only in Nova Scotia, New Brunswick, Ontario, and Quebec, where they are limited to rural areas. In other provinces such units are designated as districts, or the local government is carried on at the village, township, or city level.

There are 62 administrative counties in England and Wales, and 33 civil counties in Scotland. The principal officers of an English county are the sheriff, coroner, justice of the peace, and lord lieutenant. The Local Government Act of 1888 introduced elective county councils charged with the maintenance of roads and bridges, education, health, and charitable institutions.

COUNTY AGENT. See American Farm Bureau Federation; Extension Service.

COUNTY COURT, a local tribunal in the United States, the United Kingdom, and Canada. In England county courts have been held since the tenth century. Usually consisting of an ealderman (earl), a bishop, a sheriff, and other ecclesiastic or lay persons, they had jurisdiction in civil, criminal, and ecclesiastical cases. Reformed in 1846, county courts were limited to civil suits involving claims of not more than £100. County judges since 1846 have been appointed by the lord chancellor, except in the Duchy of Lancaster.

In the United States, county courts have both criminal and civil, as well as original and appellate, jurisdiction. County judges are elected in most states by popular vote, usually for terms of four years. The jurisdiction of county courts is usually restricted to actions involving less than $1000 and to misdemeanors. In some states there are no county courts, in others county courts have administrative powers for managing county affairs. In a few states, some county courts are designated as city courts. One or more counties always comprise a judicial circuit, served by a circuit or district court.

In Canada, county or district courts exist in all provinces except Quebec, usually having both original and appellate jurisdiction in civil and criminal matters. County judges are appointed for good behavior by the federal government. See Local Government.

COUP D'ÉTAT, literally "stroke of state," is an unconstitutional change of government effected by one or more officials of a state who alter in their favor the terms on which their office or offices are held. This "change from above" distinguishes a coup d'état from a revolution. Although the phrase has been associated with the actions of Napoleon Bonaparte in 1799 and Napoleon III in 1851, coup d'état is a phenomenon as old as history. Comparatively recent examples include Mussolini's coup d'état in 1925 and that effected by the Communists in Czechoslovakia in 1948. Such unconstitutional governmental changes are common in politically immature or loosely integrated countries. See Revolution.

COUPERIN, FRANÇOIS, called "le Grand," 1668–1733, French musician and composer, was born in Paris. He was the foremost member of a family prominent in French music for more than 200 years. When François was but 11 his father died and the child inherited from him the post of organist at Saint-Gervais. Having studied music with his father, and then with his uncle and with Jacques Thomelin, the eminent polyphonist, François actively assumed his office in 1685 (or early 1686), at the age of 18. This was but the first of several important posts held by "le Grand," and he enjoyed the special favor of Louis XIV who, in 1693, appointed him successor to Thomelin as one of four *organistes du roi*. In this role Couperin was not an organist, but supplied new music to be played at the Royal Chapel and directed its performance; he was, however, one of the foremost organists of the time. In 1696 Couperin was ennobled and a few years later was made a chevalier of the Lateran order. After 1694 he had the responsibility for giving musical instruction to the royal children, a privilege which was his even after Louis' death in 1715. By 1701 he appears to have been virtually in complete charge of things musical at court, and by 1710 he was a national figure with "le Grand" very much a part of his name. In 1717 he was finally given the title appropriate to these duties he had actually been performing.

Although Couperin wrote a great deal of first-rate chamber music and, in addition, many songs and works for the organ, he is best known for his harpsichord music, the best of which he issued with his own name as publisher under the title *Pièces de Clavecin* (four books, 1713, 1716–17, 1722, and 1730); the most accurate modern edition of this work, that of Brahms and Chrysander, was first issued in 1888 and was kept in print thereafter. Apart from the fact that these pieces, arranged not in suites but in 27 orders, were superb compositions, they have a unique historical importance. Against the prevailing practice of writing down as little as possible to allow maximum latitude for the performer's own interpretation, Couperin printed his music just as he wanted it played, even going so far as to indicate the proper embellishments. Moreover, he wrote a manual on how to play the "clavecin" (or any other keyboard instrument); in *L'art de toucher le clavecin* (1717), perhaps the first keyboard "school," Couperin provided instruction on playing keyboard instruments that was fully as appropriate centuries later as it was in his own day. Though he wrote about playing the clavecin, Couperin's remarks applied equally well to the piano; similarly, the music he wrote for the clavecin was eminently successful when properly performed on the piano. His *Pièces de Clavecin*, although often descriptive, form a part of the canon of those who look for "pure music." With an economy of means, itself an indication of his genius, Couperin gave to posterity a collection of fragile miniatures that well justify his title, "le Grand." F. S.

COUPERUS, LOUIS, 1863–1923, Dutch novelist, was born in The Hague of Scottish ancestry. He spent his early life in the Dutch East Indies, where his father was a government official. His early work reflected the influence of the French naturalists and of Tolstoy, but he was never inhibited by devotion to the scientific method, and in his subtle delineations of character came to depend more and more on his own intuition. Among his best works were *Eline Vere* (1889), a study of a woman haunted by heredity; *Die Kleine Zielen*, 1901–03 (*The Book of the Small Souls*, 1932), a long, family chronicle; and three historical novels, *De Berg van Licht* (1905), *Xerxes* (1919), and *Iskander* (1920).

COUPLET, in poetry, two lines of rhymed verse which in themselves complete an idea. A 14-line poem, for instance, might be in seven couplets. Early English drama, in which little or no scenery and no curtain was used, employed couplets to signify the end of a scene. Thus, at the end of Act II, Scene II of Shakespeare's *Henry V*, King Henry says:

"Cheerly to sea; the signs of war advance.
No king of England, if not king of France!"

The *heroic couplet*, a pair of rhymed lines usually but not always in iambic pentameter, was thought to have been first used in English poetry by Chaucer who in *The Legend of Good Women* says:

"A thousand times have I heard men tell
That there is joy in Heaven and pain in Hell."

The seventeenth century English poet John Dryden used the heroic couplet as perhaps his chief poetic instrument; he employed it in many of his early tragi-comedies, such as *Secret Love*, or the *Maiden Queen* (1667), and later in his longer poems. In the eighteenth century, Alexander Pope, called the supreme master of the heroic couplet, used the device to display his satirical wit in a series of brilliant epigrams. Pope achieved an amazing variety of lyrical effects within the confines of the two-line rhyme. In the *Essay on Man* (1773) he counsels:

"Laugh where we must, be candid where we can,
But vindicate the ways of God to Man."

COUPLING, a mechanical device that connects the ends of adjacent parts or objects. Shaft couplings connect shafts in many kinds of machines. Flexible shaft couplings, such as universal joints, permit a reasonable amount of misalignment of the shafts. Nonflexible shaft couplings are used where the connected shafts run in alignment. Couplings that permit disengagement of the shafts while rotating are called clutches (see CLUTCH). Hose couplings link sections of flexible hose such as fire hose and hydraulic system hose. They usually consist of mating threaded sections that screw together to make the connection. Pipe couplings are threaded links screwed onto the pipe ends to be joined. Railroad couplings are the devices that link cars together; a pivoted hook is attached to a drawbar at each end of a car and when two cars are pushed together the hooks interlock. The coupling is opened by lifting the locking pin by means of a lever at the side of the car.

COURANTYNE RIVER, or **CORANTYNE,** on the borders of British Guiana and Surinam, rises in the Serra Acaraí near Brazil and flows generally N to the Atlantic Ocean. The Courantyne River has a length of about 450 miles and is navigable in its lower reaches. Numerous waterfalls and rapids occur in the upper sections.

COURBET, GUSTAVE, 1819–77, French painter called the apostle of Realism, was born in Ornans. He had very little formal training in art, preferring to study on his own in order to paint with "intelligent and independent individuality," as he put it. His paintings, sometimes brutally realistic, were an extreme departure from the "pretty" landscapes and mannered historical scenes of his day. Courbet asserted that "all the museums should remain closed for 20 years so that the moderns might at last begin to see with their own eyes." His work soon became well known in artistic circles and was much admired by the young social-protest painters; it found little favor with critics, however, who called him peasant and butcher—labels which Courbet wore proudly. But his work caused too much comment to be ignored and he was invited to exhibit in the World Exhibition of 1855 (in Paris); when his canvases were given an unfavorable place he withdrew them and set up his own show in a wooden booth placed at the entrance to the exhibition. A placard announced: "Realism—G. Courbet." The little booth was a huge success and, although the French Salon excluded him for a time as penalty for his bad manners, he was awarded a medal for *The Battle of the Stags* in 1861.

As radical in politics as he was in painting, Courbet announced, "I am not only a socialist, but a democrat and republican—that is to say a supporter of every revolution." He put his words into practice by actively supporting the Paris Commune, 1870, having

previously spurned the Order of the Legion of Honor offered him by the emperor. The provisional government appointed him director of fine arts, the capacity in which he was to safeguard France's art treasures from mob violence during the siege of Paris. As a result, when the Commune fell, Courbet was held personally responsible by the new government for the destruction of the Vendôme column, a historical monument, and was sentenced to six months in jail and fined 334,000 francs. His later paintings were refused by the Salon on the ground that he was morally unworthy to take part in exhibitions. So Courbet *le grande maitre* became Courbet *le colonnard*. "They have killed me," he said. "I shall never do anything good again." He died in exile, unable to meet further claims by the government. Courbet's dictum, "the principle of realism is the negation of the ideal," is well embodied in paintings such as *The Funeral at Ornans* (1850) and *The Return from the Conference* (1860).

COURBEVOIE, city, N central France, in the department of Seine, on the Seine River, a NW suburb of Paris. Courbevoie manufactures automobiles, bicycles, plumbing fixtures, and electrical equipment. Pop. (1954) 58,699.

COURCELLE, DANIEL DE RÉMY, SIEUR DE, 1626?–98, French governor of New France (in Canada) after 1665, replacing Mézy. His first expedition against the Mohawk Indians in 1666 was a failure but he later subdued them with the help of the Marquis de Tracy, and also concluded a peace treaty with the Iroquois, 1667. De Rémy established a Lake Ontario trading post which later became Fort Frontenac. His governorship was marked by peaceful relations with surrounding Indian tribes and prosperity for traders. He returned to France in ill health in 1672, and was succeeded by the Comte de Frontenac.

COUREUR DE BOIS, an unlicensed fur hunter in New France; literally a runner of the woods, or bushranger. The fur trade was a major activity of New France and attracted many vigorous and adventurous settlers. The colonial government attempted to limit the trade to those who were granted licenses in order to maintain and strengthen the settlements, keep good relations with the Indians, and prevent the furs from going to the English colonies. The effort was a failure. Men went off to the wilderness to hunt, trap, and trade, without permission, and the government was powerless to stop them. *Coureurs de bois* explored widely in the Great Lakes region and the interior of the continent, often living and intermarrying with the Indians. It has been estimated that as many as a third of the able-bodied men of New France went to the wilderness. Famous *coureurs de bois* included Pierre Radisson, Médard Groseilliers, and Daniel Du Lhut or Du Luth.

COURIER, PAUL LOUIS, 1772–1825, French writer, was born in Paris. He attended the artillery school at Châlons and entered the army, 1792. He served in Italy and in Germany, and left the army after the bloody battle at Wagram, Austria, 1809. In the same year he went to Florence, where he discovered and edited Longus' Greek pastoral *Daphnis and Chloë* (1810). Returning to France, 1812, Courier became known after 1816 as a pamphleteer opposed to the Restoration government. His bitterly satirical *Simple Discours* (1821) stirred such controversy that he was thrown into prison, but he was released after two months. *Le Pamphlet des Pamphlets* (1824), known for its brilliant, if somewhat quaint style, was his last work. In 1825 Courier was murdered, probably by his servants.

COURLAN. See Limpkin.

COURLAND. See Kurland.

COURSING. See Dog Racing.

COURT, a tribunal for the public administration of justice. Courts for the punishment of offenses against the peace and dignity of the state and for the settlement of controversies among individuals are a necessary part of the machinery of government in every organized society. In a monarchical system the preservation of the peace and the administration of justice are recognized as the highest prerogatives of the monarch. The person to whom these functions are delegated becomes a judicial officer, and the tribunal in which he presides is the court.

As commonly organized a court is composed of one or more judges, a clerk, and a marshal or similar officer for the preservation of order. The counsel or advocates in attendance and a jury (in a proper case) constitute part of the tribunal.

The administration of justice is a public function in England and the United States, and any proper person, whether connected with the business of the court or not, is entitled to attend and witness the proceedings. Another important feature of the English and United States judicial systems is the fact that the courts do not go out of their way to do justice or enforce the law of the land. They have no inquisitorial functions, nor do they, unless required by statute so to do, give opinions on abstract questions of law, but content themselves with the decision of actual controversies brought before them. Such decisions may change the law by setting a precedent.

Jurisdiction of Courts. The jurisdiction and powers of the several courts which divide the administration of justice among them are usually determined by statute, though the superior tribunals of England for centuries exercised a jurisdiction determined by their own customs, and the jurisdiction of the Supreme Court of the United States is defined by the Constitution, and is, therefore, not subject to alteration by act of Congress.

Courts are variously classified according to the scope and character of the jurisdiction which they are authorized to exercise. Thus a court of first instance, or a *nisi prius* court, is one which exercises an original jurisdiction, while an appellate court is one charged with the duty of reviewing the judgments rendered in an inferior tribunal. Some courts, such as the Supreme Court of the United States and the old court of King's Bench in England, may exercise both an original and an appellate jurisdiction, though the present practice is to commit the hearing of appeals to courts which have no other function. The distinction between courts of record and courts not of record is an ancient one, and corresponds closely to the more usual classification of courts as superior and inferior.

Some courts are restricted to a jurisdiction of a special character, as magistrates' or police courts; courts of general and special sessions, which have only a criminal jurisdiction; and the chancery tribunals, which exercise only an equity jurisdiction. Oth-

A judge of the Lake County, Ill., circuit court fines and sentences 39 sit-down strikers found guilty of defying a court injunction. The defendants are seated at the right.

UP

ers, such as the municipal and county courts, are confined to litigations involving small amounts, or to causes originating within a limited territory. A court of general jurisdiction, on the other hand, is one whose jurisdiction is coextensive with the state, or to which a cause of any value may be brought, or which may hear and determine all classes of cases, whether civil or criminal. The most important division of jurisdiction in our legal system has been that between the ordinary tribunals, administering the common law, and the courts of equity, and this, though abolished in England and some states of the United States, still exists in others.

Courts in the United States. The federal system of the United States has resulted in the creation of two distinct and parallel systems of judicial administration—that of the United States courts, which administer the federal law throughout the nation, and that of the several states within their respective boundaries. The Constitution (Art. III, secs. 1, 2) vests "the judicial power of the United States in one Supreme Court and in such inferior courts as the Congress may from time to time ordain and establish." It further provides that "the judicial power shall extend to all cases in law and equity arising under this Constitution, the laws of the United States and treaties made or which shall be made under their authority; to all cases affecting ambassadors, other public ministers and consuls; to all cases of admiralty and maritime jurisdiction; to controversies to which the United States shall be a party; to controversies between two or more states; between a state and citizens of another state; between citizens of different states; between citizens of the same state claiming lands under grants of different states; and between a state or citizens thereof and foreign states, citizens, or subjects." This jurisdiction of the Supreme Court is declared to be appellate only, except in cases affecting ambassadors, other public ministers, and consuls, and those in which a state shall be a party, as to which the court shall have original jurisdiction.

The federal courts fall into three classes: the Supreme Court, the Circuit Courts of Appeals, and the District Courts.

Supreme Court. See SUPREME COURT OF THE UNITED STATES.

Circuit Courts of Appeals were created by act of Mar. 3, 1891. Their function is to relieve the Supreme Court of much of its appellate work; their decrees are final in many matters when the amount involved does not exceed $1000. The circuit courts have no original jurisdiction. Cases are brought to these courts on appeal from the district courts, and in some cases a further appeal may be taken to the Supreme Court of the United States. Whenever a circuit court holds a state law invalid as in conflict with the federal Constitution, laws, or treaties the decision may be appealed to the Supreme Court. Since 1929 the United States has been divided into 10 judicial districts and the District of Columbia, each of which has a circuit court of appeals. At present there are 58 circuit court judges, the number varying from three to seven in each circuit. Seven of the Supreme Court justices are assigned one to each circuit; the remaining four circuits are divided between the other two justices.

District Courts are the lowest class of federal tribunals; they were created by act of Sept. 24, 1789. There are now more than 90 districts, including the District of Columbia, each of which has at least one district judge. The district courts are the principal federal trial courts of first instance, or original jurisdiction; they hear most of the cases within federal jurisdiction, and they make a final disposition of the majority of them. Besides the judges, each district has an attorney, a marshal, a commissioner, a clerk and deputy clerks, assistant attorneys, office deputies, referees in bankruptcy, and probation and parole officers.

In addition to these courts there are also the United States Court of Claims, established in 1885 for the purpose of dealing with claims of private persons against the federal government; the United States Court of Customs and Patent Appeals (see CUSTOMS AND PATENT APPEALS, U.S. COURT OF), a specialized appellate court established in 1910 to facilitate the settlement of disputes in the fields indicated; the United States Customs Court, until 1926 called the Board of U.S. General Appraisers, with jurisdiction over actions arising under the tariff laws; territorial courts in Guam, Puerto Rico, the Canal Zone, and the Virgin Islands, serving to exercise the same jurisdiction as do district courts; the U.S. Court of Appeals for the District of Columbia and the District Court of the United States for the District of Columbia, which courts have a dual function, operating first of all as integral parts of the federal system of courts and also as legislative courts exercising much the same jurisdiction enjoyed by state courts.

State Courts. There is great diversity in state judicial organization but the general features of the system are much the same, with three levels of tribunals—a supreme court, a court of appeals, and a system of trial courts of first instance. In 42 of the states the highest court is called the supreme court; but in New York, for instance, it is the first court of appeals. The intermediate appellate court is sometimes called the court of appeals, but it may be designated the superior court, the circuit court, or the district court. The lowest court may be called the county court, the circuit court, or the district court. (The county court in some states is a tribunal of specialized jurisdiction, while in other states it is the county administrative body and not a court at all.) Seven states have also a special chancery court. In most of the states all judges are elected, but in others some or all are appointed by the governor or chosen by the state legislature. The terms of judges vary from two years to life (Massachusetts and Rhode Island have life terms), but the period is normally six years or more for higher courts and four years or more for lower courts. Other state courts are the probate courts (sometimes under other names), municipal courts, justices' courts of cities and villages, justice of the peace courts in rural districts, police courts, and others too various to be described. All of these are knit together by a system of appeals, whereby the action of inferior magistrates is in the last analysis controlled by the higher tribunal, although the higher courts do not necessarily accept all appeals.

Courts of Great Britain. Prior to 1873 the English judicial system was one of great complexity, the result of a thousand years and more of natural evolution. The superior courts comprised the three great common law tribunals—the Court of King's Bench, the Court of Common Pleas, and the Court of Ex-

The world's oldest court, the court of coronation claims, sits in the privy council chambers in London to determine the rights of claimants to serve the monarch at coronation.

chequer. These were of nearly equal dignity and importance, though the Court of King's Bench enjoyed a certain pre-eminence, the presiding judge of the court being styled the lord chief justice of England. Side by side with the common law tribunals the High Court of Chancery, presided over by the lord chancellor of England, administered the equity jurisdiction of the crown. The chancellor was assisted by a vice-chancellor and a master of the rolls. Other superior courts were the probate and divorce courts, whose jurisdiction was carved out of that of the ecclesiastical courts, the Court of Admiralty, and the London Court of Bankruptcy. The judicature act of 1873, which reformed the entire judicial system of England, consolidated all of these courts into one Supreme Court of Judicature. For administrative purposes the Supreme Court is divided into two parts—the High Court of Justice and the Court of Appeal. The former of these is further organized in three divisions—the Chancery Division, dealing with wills, settlements, trusts, mortgages, etc.; the King's Bench Division, primarily concerned with the administration of the common law; and the Probate, Divorce, and Admiralty Division. Generally these divisions have only original jurisdiction, although the King's Bench Division has certain appellate powers. The Court of Appeal is, as the name implies, a court of appellate jurisdiction, cases coming to it from the High Court of Justice as well as from the county courts in certain cases. The supreme court of appeal in England is the House of Lords, the judicial functions of which are performed by the lord chancellor, the lords of appeal in ordinary, and the other members of the house who have held high judicial office. Final appeals from the colonies and certain of the Commonwealth countries are heard by the judicial committee of the Privy Council.

In the field of civil law the courts of first instance are the county courts and the King's Bench at the Assizes (held by judges of the King's Bench on circuit), and in London and Middlesex the High Court of London. Criminal jurisdiction is exercised by the judges of the High Court sitting at Assizes, by the Central Criminal Court (in London), the Courts of Quarter Sessions, and the Courts of Petty Sessions. Appellate jurisdiction in the criminal field is vested in the Court of Criminal Justice, and then in the House of Lords.

Scotland. The supreme civil court is the Court of Session, from which there is no appeal except to the House of Lords, which has since the Union exercised in this respect a power formerly in the hands of the Scots Parliament. The roots of the Court of Session lie as far back as the reign of James I, but its complete establishment as an effective court may be considered to date from 1532. The Court of Session is both a court of law and a court of equity. It has no criminal jurisdiction, though it may punish contempt of court and breach of interdict. In certain civil cases it has an exclusive jurisdiction—for example, in actions relating to status and declarators of property. In other cases its jurisdiction can only be sought by way of appeal from inferior courts, appeals from which are brought directly to the inner house.

The supreme criminal jurisdiction in Scotland is vested in the High Court of Justiciary. The judges are the judges of the Court of Session, and the court sits in Edinburgh on the requisition of the lord advocate. Sittings are also held in the circuit towns whenever there are cases for trial. The court has the widest possible jurisdiction with regard to all offenses against the general law, but on circuit prisoners are tried only for crimes committed within the area of the circuit. There is no appeal from the High Court of Justiciary, but appeals lie to it from inferior courts in criminal matters on questions of law.

Canadian Courts. There are two federal courts in Canada, the Supreme and Exchequer courts; the former has appellate jurisdiction—subject to limitations—from the superior courts of the provinces. The Exchequer Court has jurisdiction where the revenue or property or other interest of the Crown is involved, and as an admiralty court. In certain cases an appeal lies from the Exchequer to the Supreme Court.

Each province has a Superior Court, and the majority have county courts. Appointments to both are made by federal authority. The provincial governments retain the appointment of police magistrates and justices of the peace.

Other Foreign Courts. In France there are two separate sets of courts—those dealing with civil and criminal cases, with the Court of Cassation as a final court of appeal; and administrative courts headed by the Council of State. A jury is employed only in serious criminal cases tried in departmental Courts of Assize.

In the German Federal Republic there are only three federal courts—the Federal Supreme Court, dealing with civil and criminal appeals from state courts; the Federal Constitutional Court; and the Federal Finance Court.

In the Soviet Union, the courts include the Supreme Court of the U.S.S.R., supreme courts of the Union's republics, territorial or regional courts, and the people's courts. All courts are elective. Independent of the courts is the important office of the procurator-general. Some political offenses are tried in absentia by special tribunals. There are also special military and industrial courts. Despite a constitutional guarantee of judicial independence, the courts are used as political instruments of the Soviet state and the Communist party. See COUNTY COURT; COURT OF CLAIMS; COURTS, MILITARY; CUSTOMS COURT; JURISDICTION; LAW; PROBATE COURT.

COURT, ADMINISTRATIVE, a public tribunal or authority, established outside the regular court system to pass on the legality of administrative actions. In most of the countries of Europe special administrative courts have been established in hierarchical order with rights of appeal from the lower to the higher. For example, in France the chief administrative courts are the following in descending order: the council of state, interdepartmental prefectural councils, and the councils of litigation in the colonies. In Great Britain and the United States there are no administrative courts as such, but numerous commissions, boards, and officials have been established and vested with quasi-judicial powers in the field of public administration. Most of the American agencies which exercise quasi-judicial power have other functions in addition, including that often called quasi-legislative or administrative rule making; in many cases the quasi-judicial function is merely incidental to the duties of public administration. In the U.S. federal government the following are the most prominent agencies with quasi-judicial powers: Interstate Commerce Commission; Federal Trade Commission; Federal Communications Commission; Federal Power Commission; National Labor Relations Board; Securities and Exchange Commission; the Customs Court in first instance and the Court of Customs and Patent Appeals in second instance; the Court of Claims; and the Board of Tax Appeals. In addition, certain departmental heads, especially the secretary of labor and the secretary of the interior, and other federal officials exercise incidental judicial powers. In the states the more important administrative tribunals are the public utility regulatory bodies usually called public utility commissions, railroad commissioners, workmen's compensation commissions, and certain health authorities.

A person who is adversely affected by an administrative action may appeal for a review. For example, a person who is dissatisfied with a decision of a customs official may appeal to the Customs Court and beyond that to the Court of Customs and Patent Appeals; an immigrant who is ordered excluded may appeal to the Board of Immigration Appeals. The

Federal Trade Commission, which operates to prevent unfair methods of competition, exercises quasi-judicial powers in its normal administrative duties; if a "cease and desist" order is contested by the party affected the commission must grant a hearing before the order becomes final. The procedure in the hearing before an administrative tribunal is usually much more informal than before a court. In most instances these tribunals have jurisdiction as to both law and fact. Usually a person may appeal from the decision of an administrative agency to the regular courts, sometimes as to law alone, sometimes as to both law and fact; the "Due Process of Law" clause provides a frequent ground for appeal. Administrative tribunals must act within the law and according to law. At first the regular courts were highly critical of such procedure, and for this reason they would often go over the whole issue, but in the last two decades they have been much more tolerant while reserving to themselves the right of review to prevent abuse. Administrative tribunals are necessary today in order to relieve the ordinary courts of a great mass of work; they can initiate investigations and institute proceedings; they also permit a degree of specialization which would otherwise not be possible. See Administrative Law.

COURT, CONTEMPT OF. See Contempt of Court.

COURT, JUVENILE. See Children's Courts.

COURT-MARTIAL. See Courts, Military.

COURT OF CLAIMS, U.S., a special federal court established on February 25, 1855, to provide a means of determining the validity of certain kinds of claims against the United States. Formerly relief in these cases could be obtained only by special act of Congress. The court hears and determines all claims founded on any act of Congress or any regulation of an executive department, or on any contract with the U.S. government and all claims referred by Congress or the executive departments. The court's jurisdiction was later extended to torts or wrongs committed by an officer of the United States. Proceedings in the Court of Claims are instituted by petition and the procedure followed is similar to that of the ordinary tribunals. The court consists of a chief judge and four associate judges. It hears cases sitting *en banc*, with all judges present. Other officers of the court are 11 commissioners, a clerk, a bailiff, and their assistants. In certain cases, especially on constitutional questions, appeals may be taken to the Supreme Court.

Similar courts exist in other countries and in some other American states. Under the prevailing theory of sovereignty a state may be sued only by its express consent; but some states permit suits against themselves in their regular courts.

COURT OF COMMON PLEAS, one of the tribunals of common law in England, provided for in Magna Charta for civil suits between the subjects; since 1873 merged with the King's Bench Division of the High Court of Justice. In the United States, a state circuit court sits as a court of common pleas when it hears civil cases, and as a court of general sessions in criminal cases.

COURT OF CUSTOMS AND PATENT APPEALS, U.S. See Customs and Patent Appeals, U.S. Court of.

COURTRAI, in Flemish, Kortrijk, town, W Belgium, in the province of West Flanders, on the Lys River, 26 miles SW of Ghent. Courtrai, a communications and industrial center, is particularly noted for textile manufacture, including linens, cottons, lace, and synthetics. The thirteenth century church of Notre Dame is the burial place of the counts of Flanders and contains Van Dyck's famous painting *The Elevation of the Cross*. Other features of interest include ancient churches, fifteenth century fortresses, and a sixteenth century town hall. Outside the walls of Courtrai, in 1302, was fought the first Battle of the Spurs, in which a French army was routed by the Flemish. Pop. (1951 est.) 40,409.

COURTS, INTERNATIONAL. Although the concept of a world court had been expressed earlier, no positive steps were made toward its realization until the end of the nineteenth century. At least as far back as ancient Greece there were instances of the settlement of international disputes by arbitration. In more modern times there have been numerous occasions in which the pope or the head of a state served as an arbitrator, or in which groups of arbitrators were chosen to decide a specific case as it arose. The success of several prominent arbitrations in the latter part of the nineteenth century strengthened belief held in the feasibility of an international court; and statesmen and publicists of various countries (including the American, David Dudley Field) began to think in concrete terms of a world judiciary. At length the Permanent Court of Arbitration came into being as a product of the first Hague Peace Conference of 1899. Properly a panel of jurists rather than a court, this Hague tribunal was regarded by many as merely a good beginning, likely to lead to a better system.

The U.S. delegates to the second Hague Conference in 1907 were instructed by Secretary of State Elihu Root to work for the establishment of a permanent world tribunal composed of full-time judges. Despite the co-operation of the British and German delegation, this objective was not attained. Agreement was reached on a general plan for a new Permanent Court of Arbitral Justice, but the manner of selecting judges proved a stumbling block. The insistence of the great powers that they be continuously represented on the bench by their own nationals could not be reconciled with the principle of the equality of states, which was championed by the smaller nations. An attempt was made to utilize some of the features of this proposed court in the establishment of an international prize court, but this project also failed because the principal maritime states proved unable to agree on a code of rules of prize law which could be applied by such a court.

A Central American Court of Justice, established by the five Central American republics in 1907, was notable as being an international court with a bench of full-time judges. The court was dissolved after 10 years, however, largely because the United States disapproved and disregarded its condemnation of a treaty (against which Costa Rica and Salvador had protested) under which Nicaragua granted the United States the exclusive right to build a canal through Nicaraguan territory and to erect naval bases.

The movement toward the creation of an international court was revived, with fresh incentive, after World War I, and the Council of the new League of Nations was directed to further the project. As a result there came into being the Permanent Court of International Justice, or World Court, which after World War II and the demise of the League, was superseded by a new International Court of Justice integrally associated with a new world organization, the United Nations.

Permanent Court of Arbitration. The first Peace Conference at The Hague in 1899 approved a Convention for the Pacific Settlement of International Disputes, under which was established the Permanent Court of Arbitration, popularly known as The Hague Tribunal. The Second Peace Conference at The Hague in 1907 revised the Convention, which was ultimately signed by 47 states. Each of the signatory nations appointed not more than four members for a term of six years, but the total number of judges, because of unfilled vacancies, was usually approximately 150. These judges or arbitrators never sat together as a court. Instead, they merely constituted a panel of jurists from which tribunals or courts were composed as occasion arose. (This panel was subsequently used for the nomination of candidates for

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The United Nations International Court of Justice, The Hague, the Netherlands, listens to a statement delivered by the second legal adviser of the British Foreign Office.

judgeships in the World Court and the International Court of Justice.) Thus, when states wished to refer a dispute to the Permanent Court of Arbitration, an actual tribunal was formed of arbitrators selected from the general panel. Such a tribunal usually consisted of five persons, each of the disputing states selecting one of its nationals and one nonnational; these four arbitrators chose a fifth, who acted as umpire. The tribunals sat at The Hague, unless another place was agreed on by the parties; the latter also had the right to choose arbitrators who were not members of the Hague Tribunal.

From 1899 to 1934, when the last one was submitted, 21 cases were adjudicated in this fashion, in six of which the United States was a party. Two of the most important cases were the Pious Fund Case between the United States and Mexico in 1902, and the North Atlantic Coast Fisheries Arbitration between the United States and Great Britain in 1910.

Permanent Court of International Justice. Article 14 of the Covenant of the League of Nations directed the League Council to "formulate and submit to the members of the League for adoption plans for the establishment of a Permanent Court of International Justice, competent to hear and determine any dispute of an international character which the parties thereto submit to it, and to give an advisory opinion upon any dispute or question referred to it by the Council or by the Assembly." Plans for such a court were formulated, at the invitation of the Council, by a commission of eminent jurists, on which Elihu Root of the United States played a prominent part. The resulting statute of the Permanent Court of International Justice, popularly known as the World Court, was approved unanimously by the Assembly on Dec. 13, 1920. The statute went into force in September 1921, after the protocol of signature to which it was annexed had been ratified by 28 states, and the first election of judges was held that month. Ultimately 51 states had ratified the statute; and all nations were given access to the court on equal terms, whether they were League members or not. The seat of the court was at The Hague, where the first ordinary session opened on June 15, 1922.

Originally there were 11 judges and four deputy judges, but in 1930 the number of judges was increased to 15. Candidates for the court were nominated by the national groups in the Permanent Court of Arbitration and elected (for nine-year terms) by the Council and the Assembly, voting separately.

Jurisdiction. The jurisdiction of the World Court was "voluntary" in those cases in which states agreed to refer a dispute between them to the court. Its jurisdiction was "compulsory" or, more properly, automatic when disputants were signers of an Optional Clause of the court's statute, or when special agreements, such as were contained in numerous treaties and conventions, explicitly gave the court obligatory jurisdiction. The Optional Clause bound the nations which had signed it (ultimately 45) to "accept as compulsory, *ipso facto* and without special convention" the jurisdiction of the court in all legal disputes concerning the interpretation of a treaty, any question of international law, a breach of an international obligation, or the nature of reparation to be made for such a breach. States accepting this automatic jurisdiction in advance might do so unconditionally, on the basis of reciprocity, or subject to other reservations. Thus under some conditions the court could render a decision at the application of one party to a case regardless of the other party's consent at the time. The court also exercised its function of giving advisory opinions on legal points at the request of the Council or the Assembly.

As a court of law (rather than of arbitration, like the Hague Tribunal) the World Court based its decisions on legal principles and their application as found in treaties and conventions, international custom, the general pinciples of law recognized by civilized nations, and the teachings of qualified jurists of the various nations.

During its active period, 1922–40, the court handed down 32 judgments, about 200 orders, and 27 advisory opinions. In one of the most important judgments, in a case between Denmark and Norway, the court in 1933 recognized Danish sovereignty over all Greenland. In a case between France and Turkey, the latter was awarded damages as a result of a collision between Turkish and French vessels. Other decisions were concerned with such questions as the freedom of the Kiel Canal, interpretation of the Treaty of Neuilly signed by the Allied Powers and Bulgaria in 1919, German interests in Upper Silesia, payment of Serbian loans issued in France, and settlement of a Franco-Swiss dispute over the free zones in Gex and Upper Savoy.

One of the significant advisory opinions was that handed down in 1931 which declared that the proposed Austro-German customs union would not be compatible with the Geneva Protocol of 1922, under which Austria, which agreed not to alienate her independence, was advanced a rehabilitation loan; but the court majority did not consider the union incompatible with the Treaties of Versailles or St. Germain.

In general the judgments and opinions of the World Court formed a valuable addition to the body of customary international law, and in specific cases was instrumental in effecting peaceful solutions to problems such as had in the past provoked or at least been conducive to belligerent action.

Though American adherence to the World Court was recommended by Presidents Harding and Coolidge, the step was blocked by the Senate. In 1926 the Senate agreed to approve the protocol of the court with five reservations. Virtually all these were accepted by the states which were members of the court except the one stating that the court should not "without the consent of the United States entertain any request for an advisory opinion touching any dispute or question in which the United States has or claims an interest." Further efforts were made in 1929 to amend the court's protocol to overcome the Senate's objections, and on December 9 the signature of the United States was affixed to the protocol; ratification was not forthcoming from the Senate despite the urging of Presidents Hoover and Franklin D. Roosevelt. Several eminent American jurists, nevertheless, served as World Court judges, namely John Bassett Moore (1921–28), Charles Evans Hughes (1928–30), Frank B. Kellogg (1930–35), and Manley O. Hudson (1936–46).

In its final session, at Geneva, the Assembly of the League of Nations on April 18, 1946, voted to end the existence of the World Court. On the same day a new court, the International Court of Justice,

succeeding the old one, held its opening session at The Hague.

International Court of Justice. In the discussions and conferences which led to the establishment of the United Nations, general satisfaction with the record of the World Court and support for its continuation were expressed. The association of that tribunal with the League of Nations, however, made it more practicable to create a new court. The United States, the Soviet Union, and 13 other states represented at the San Francisco Conference of 1945 were not parties to the protocol of the World Court; three signatories of that protocol no longer existed as as a result of the war, and 15 others were not represented at San Francisco.

The charter of the United Nations, signed by 50 nations at San Francisco on June 26, 1945, was declared in force on Oct. 24, 1945, after ratification by the Big Five powers and a majority of the other signatories. The International Court of Justice was established as one of the "principal organs of the United Nations" (Article 7 of the Charter) and was its "principal judicial organ." In general the new court differed little in character from the World Court, and its statute, which was annexed to the UN Charter, was substantially the same as that of the earlier tribunal. In fact, it was based upon the statute of the Permanent Court of International Justice and formed an integral part of the present charter (Art. 92). "All members of the United Nations," moreover, were "*ipso facto* parties to the statute of the International Court of Justice" (Art. 93). The United States and the Soviet Union, thus, were from the beginning, along with the other members of the United Nations, committed to support of the new court.

The nomination and election of judges to the court were by virtually the same process as that used for the World Court. For election, an absolute majority was necessary in the General Assembly and in the Security Council, which voted separately and concurrently. An innovation was the provision for staggering the nine-year terms of the judges, so that one-third of the 15 members were elected every three years (except in the first election). The Peace Palace at Hague continued as the court's site.

The jurisdiction of the court was the same as that of the old World Court, with a similar optional clause (see above). Members of the United Nations undertook to comply with court decisions in cases to which they were a party; but if any party to a case did not comply, "the other party may have recourse to the Security Council, which may, if it deems necessary, make recommendations or decide upon measures to be taken to give effect of the judgment" (Art. 94). The General Assembly or the Security Council could request the court to give advisory opinions on legal questions, as could other UN organs or specialized agencies when so authorized by the General Assembly.

During the period 1946–1954, the International Court of Justice delivered 14 judgments, 51 orders, and 8 advisory opinions. Among the most important cases before the court were the *Corfu Channel* case (1949), in which the court awarded to the United Kingdom compensation to be paid by Albania for the damage and loss of human life resulting from a 1947 incident; the *Anglo-Norwegian Fisheries* case (1950), upholding a Norwegian claim as to that country's territorial waters; and the case concerning the *Rights of the U.S. Nationals in Morocco* (1952), in which the court affirmed the United States' rights acquired under the Act of Algeciras of 1906.

Among significant advisory opinions handed down by the court since 1946 were those concerning reparation for injuries incurred in the service of the United Nations (1949), the interpretation of peace treaties with Bulgaria, Hungary, and Rumania (1949), and the international status of South-West Africa (1950).

On the whole, the postwar years showed a decline in the number of cases submitted to the International Court of Justice, as compared with its interwar predecessor. The court's prestige was not enhanced by such developments as the nonimplementation of several of its decisions, an increasingly political attitude of the UN members in elections to the court, and consistent opposition of the Communist states to the court, which excluded the latter as a means of solving tensions relating to the "cold" war.

The court's composition reflected the shifting balance of political power in the United Nations; the number of European judges decreased to six as against 10 in the 1922 Permanent Court of International Justice, while the number of judges representing other continents rose from five in 1922 to nine in 1954. In 1956 the countries represented on the court were the United States, the United Kingdom, the U.S.S.R., France, China, Mexico, El Salvador, Argentina, Uruguay, Norway, Pakistan, Egypt, Canada, Poland, and Yugoslavia. Green H. Hackworth (U.S.) was elected president of the court in 1955. See AGGRESSOR NATION; ARBITRATION, INTERNATIONAL; HAGUE CONFERENCES; INTERNATIONAL LAW; LEAGUE OF NATIONS; PEACE; UNITED NATIONS; WAR CRIMES.

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COURTS, MILITARY. Military tribunals in the U.S. Army are classified as courts-martial, courts of inquiry, and military commissions. Of courts-martial there are three types: general, special, and summary, all intended to try offenders against military law. Courts of inquiry are for the examination of transactions of officers and soldiers, or of imputations or accusations against them. Military commissions are for the trial of offenders against the laws of war and martial law. The jurisdiction of courts-martial is limited to the purpose of maintaining military discipline, and their decisions within this jurisdiction are not reviewable by any court except the Court of Military Appeals. Courts-martial have jurisdiction over all persons in the military pay and service of the United States, including camp retainers in wartime in any and all places, military offenses not being territorial.

A Uniform Code of Military Justice for the army, navy, and air force of the United States was enacted May 6, 1950, effective May 31, 1951. The result of two years' study initiated by Secretary of Defense James V. Forrestal, it superseded the Articles of War of the Army and of the Air Force, the Articles of Government of the Navy, and the disciplinary laws of the Coast Guard.

It created a Court of Military Appeals, consisting of three civilian judges appointed by the president for terms of eight years at salaries of $17,500 a year. The Court of Military Appeals was authorized to review cases involving death sentences, cases affecting general or flag officers, and other cases on appeal.

The uniform code authorized enlisted men and warrant officers to sit on military courts; enlisted men have the right to demand that other enlisted men be included as members of the court to try them. Accused persons were given the right to cross-examine witnesses through competent counsel, at pretrial investigations. Officers were made subject to trial by special as well as general courts-martial, and were made subject to lesser punishment than dismissal from the service for minor offenses in time of war, including such punishment as reduction to the grade of private. Courts-martial were forbidden to accept pleas of guilty in cases subject to capital punishment. A lesser punishment than death or imprisonment for life was permitted in cases of murder or rape.

A General Court-Martial may be composed of any number of members (more than five) including a judge advocate, and a law member who must be a member of the Judge Advocate General's corps. Commanding officers, when empowered by the president,

have authority to order a general court-martial for the trial of persons under their jurisdiction.

A military offense having been committed, charges and specifications are prepared against the offender. A military charge corresponds to a civil indictment and is supported by specifications which set forth the facts constituting the offense. After a charge has been preferred the commanding officer investigates the case, endorses his recommendation thereon, and forwards it to the authority competent to order a general court-martial. The court, having been duly ordered, assembles at the place and time specified in the order. The members take seats in order of rank—the president (the senior officer present) at the head of the table, and the judge advocate, named as such in the order, at the foot. The president maintains order and conducts the business of the court. The judge advocate prosecutes in the name of the United States, and must also consider himself the counsel of the accused in that he must prevent the accused from incriminating himself.

The accused may challenge any member of the court for cause stated to the court and is entitled to counsel. After these matters have been explained to the accused and if he has no further objections to any remaining members, the judge advocate administers the oath to the members and is in turn sworn to his duty by the president. The accused is then arraigned and tried by the court, the findings and sentence being sent to the convening authority for final action. A reviewing authority may change the sentence.

The jurisdiction of courts-martial was limited by the Toth decision of the U.S. Supreme Court, November 7, 1955, in which the court ruled that the armed forces could not arrest and court-martial civilians for crimes they had committed while in service. The court declared unconstitutional Article 3(A) of the 1950 Uniform Code of Military Justice under which the military retained jurisdiction over ex-servicemen for crimes committed in service. The court's decision thus exempted from the jurisdiction of military courts the so-called turncoats—returned American POWs who had been dishonorably discharged by the army after they had refused repatriation.

A Special Court-Martial composed of three or more members is appointed by authority of a commanding officer, and may be established for a detached command of a field officer of the army or equivalent. It has power to try all except capital offenses, and is limited in its punishments to six months' imprisonment and forfeiture of two-thirds pay for six months.

A Summary Court consists of one officer. It may be established by any commanding officer, down to and including the commander of a detached company, air force squadron, or the equivalent. It is not empowered to try officers, and can only try enlisted men with their consent. Its punishments are limited to confinement for one month, hard labor for 45 days, restriction to limits for two months, and detention of two-thirds of one month's pay.

Nonjudicial Punishment. All commanding officers are empowered to try officers or enlisted men for minor offenses. Punishment is limited in the case of officers to restriction to limits or withholding of privileges for two weeks, or forfeiture of one-half of one month's pay; in the case of enlisted men punishment may provide similar restriction or withholding of privileges, two weeks' extra duties of two hours a day, reduction in grade, confinement at sea for one week, or for three days on bread and water or restricted rations.

Courts of Inquiry may be ordered by the president or any commanding officer to investigate the conduct of an officer or enlisted men. The court of inquiry does not give opinions except when especially ordered to do so, but simply states the facts disclosed by its investigations. A court of inquiry may be demanded by any member of the armed forces whose conduct has been questioned. A court of inquiry consists of three or more officers and a counsel for the court. It has the power to summon and examine witnesses, and makes a full examination of all the circumstances, following the form of record prescribed for the general court-martial.

Navy. Prior to the adoption of the uniform code of military justice the U.S. Navy had only two forms of court-martial, the general court-martial of five to 13 officers, and the summary court-martial of three officers and a recorder. The summary court-martial was limited in its punishment to 30 days' solitary confinement on bread and water or diminished rations, or to two months' confinement on ordinary rations, reduction in rating, deprivation of liberty, bad conduct discharge, extra duties, and loss of pay. Minor infractions were punished by "captain's mast," or by deck court, consisting of one officer appointed by the captain. The navy conducted courts of inquiry in the same manner as prescribed under the uniform code.

Military Commissions were first established in the U.S. Army in 1847. During the Civil War and Reconstruction period, military commissions tried several thousand cases. Under the Reconstruction Act of 1867 such commissions served as substitutes for state criminal courts in the formerly seceded states. The most notable case of this period was *Ex parte Milligan*, decided by the Supreme Court in 1866. Lambdin K. Milligan in 1864 had been convicted of treason in connection with the activities of the Knights of the Golden Circle in Indiana. The Supreme Court held that Milligan, not being in military service, was not subject to military law, and that trial by military law was unwarranted since the state was not invaded or threatened with invasion, and the civil courts were open. Among other notable trials by military commission during the Civil War period was that of Capt. Henry Wirz, convicted of violation of the laws of war in his conduct of Andersonville prison, and hanged Nov. 10, 1865; and of the conspirators in the assassination of Lincoln, four of whom—George A. Atzerodt, Lewis Payne, David T. Herold, and Mrs. Mary E. Surrat—were hanged July 7, 1865.

In 1873 a military commission was convened for the trial of Captain Jack and other Modoc Indians for the murder of peace commissioners under a flag of truce. The conviction by a military commission of Nazi saboteurs who landed by submarine on the east coast of the United States in 1942 was upheld by the Supreme Court. In 1946 Lt. Gen. Tomoyuki Yamashita and Lt. Gen. Masaharu Homma of the Japanese army were tried by a U.S. military commission for violations of the laws of war, and their convictions were upheld by the U.S. Supreme Court.

An unprecedented departure from the United States' exclusive right to try its troops by its own courts-martial was the Status of Forces Agreement signed on June 19, 1951, by the United States and 13 other NATO powers. The agreement covered, among other things, the question of criminal jurisdiction over the troops of one NATO power when present in the territory of another, providing that a soldier committing a crime off duty was to be tried in the courts of the country where he was stationed.

DON RUSSELL

COURTSHIP among human beings is a dynamic process consisting of all the behavior involved in the winning of the love, favor, or marital acceptance of a member of the opposite sex. Although customs vary greatly throughout the world, everywhere they are geared to family interests, marriage morals, cultural standards, and the provision of care for offspring.

Among the objectives of American courtship some sociologists have listed selection, which affords an opportunity to assess the qualifications of the potential mate; accommodation, or learning to know each other; and maturation, which is the development of personal and social responsibility toward each other. Courtship has been described as being in three stages:

competition, or the seeking out of a particular love object by another person; "going steady," or the phase in which there are special dates between the individuals who single each other out; and the final period, in which choice is confirmed and the engagement to marry is entered into.

The behavior which will win favor by the desired love object is culturally determined, or is a product of the customs peculiar to the particular society in which the courtship occurs. In general, importance is placed on what is valued for a satisfactory husband-and-wife relationship within the given culture. See Betrothal; Family; Marriage.

COURT TENNIS, also called royal tennis or simply tennis, is one of the oldest games still played. Probably derived from a similar sport played by the Arabs and Egyptians, tennis was played in France as early as the fourteenth century, reaching its height in both France and England some 300 years later. It was introduced into the United States in Boston about 1876, and by 1891 had spread to New York and Chicago. Among the outstanding U.S. players were Thomas Pettitt, a professional, and Jay Gould, an amateur, but a record unparalleled in any other sport was established by Pierre Etchebaster, who successfully defended his world open championship from 1928 until his retirement in 1954.

Court tennis is played on an enclosed court about 110 feet long and 38 feet wide, with a skylighted ceiling 30 feet high. Walls and floor are of smooth cement. The actual playing area, 91 by 31¾ feet, is set off from the two end walls and one side wall by a 7-foot corridor roofed over by a low shed or penthouse. The court is divided by a net 5 feet high at the ends and 3 in the center, and its full length is also marked by a series of chase lines parallel to the net. The racquet, slightly lopsided, is 27 inches long, weighs 16 ounces, and is strung with heavy gut. The ball is of tightly wound cloth strips covered with melton cloth. Object of the game is to drive the ball over the net out of reach of the opponent. Chases are an important feature of court tennis, a chase being scored when an opponent fails to return the ball before the second bounce. The chase line on or near which the chase is scored is noted by a marker who scores the game. After two chases have been established (one if for game point), sides are changed, and the opponent must match the first player's performance or lose the chase. In other respects, scoring follows that of lawn tennis, with four winning points to a game, six winning games to a set, and two of three, or three of five, sets to a match. See Tennis.

COUSIN, JEAN, 1490?–1560, French artist known chiefly as a painter on glass, was born in Soucy. To a "Jean Cousin" have been attributed a number of paintings (on canvas), several sculptures, and a number of wood engravings, but these attributions are uncertain since both father and son used the same name. *The Last Judgment*, generally regarded as one of the first French historical paintings, may have been done by the son, Jean Cousin the Younger, 1522?–90, as were possibly the wood-engraved illustrations for Jean LeClerc's *Bible*. Which of the two Cousins wrote the *Traité de perspective* (1560) is uncertain, but it is generally accepted that the son was the author of *Livre de portraiture* (1571). Father and son seem to have worked together closely and probably collaborated on such works as the celebrated stained-glass windows of Sainte Chapelle at Vincennes.

COUSIN, VICTOR, 1792–1867, French philosopher, was born in Paris. An effective teacher of philosophy (who once lectured to as many as 2000 students at once), Cousin was by no means an original thinker. His philosophy was eclectic, combining the doctrines of eighteenth century sensationalism with the romantic and intuitional idealism of the Germans, especially Schelling and Hegel. This synthesis was not particularly successful, but provided Cousin with a point of view in terms of which he could interpret the history of philosophy; as a result his reputation as a philosopher is primarily that of a historian. Just as his philosophy was an attempt at compromise, so were his activities in the world of public affairs in which, up to 1849, he was active. In no sense a radical, he stood for a middle way between left and right, free thought and clericalism, free speech and monarchy. In a period of extremes, his politics of moderation, divorced from contingencies of daily life, was often ineffectual and more often misunderstood. Nevertheless, he was for a time the dominant figure in French education, and his views in this area had a certain influence in other European countries. He was elected to the Académie des Sciences Morales et Politiques in 1840, and during the same year became minister of public instruction in the cabinet of Thiers. Cousin is credited with liberalizing French higher education and freeing the academies from excessive clerical control. On the other hand, he vigorously opposed the liberal reforms sought by the revolutionists of 1848. Cousin's chief works are *Du vrai, du beau, et du bien* (1846), historical surveys, translations of Plato, and editions of Proclus and Descartes.

COUVADE, the custom, best known among the Basques of the Pyrenees and certain Indian tribes of Brazil, of the father lying-in and acting as though he had given birth to a child. Anthropologists believe the practice is a taboo springing from some fundamental ideas prevalent among the tribes that have adopted it, and that it was designed to protect the new-born child. Primary among these is the belief that the close relationship between father and son makes it dangerous for the father to indulge in any act which might prove harmful to him, lest some corresponding injury befall the infant. Another belief which relates to the custom is that a pregnant woman and her husband are unclean and in danger from unfriendly spirits, and therefore should be temporarily barred from daily activities. See Basque; Taboo.

Fay-Cooper Cole

COVALENCE. See Valence.

COVARRUBIAS, MIGUEL, 1902–57, Mexican painter, illustrator, and designer of stage settings, was born in Mexico City. Largely self-taught, he was much influenced by the work of his compatriot Diego Rivera. Inspired by travels in the United States, the West Indies, the Orient, and Africa, often with archaeological expeditions, Covarrubias produced a series of beautifully illustrated maps. He also made many illustrations for the *New Yorker* and other magazines. His best works portray the people of his native land in their colorful native costumes. Among the books written and illustrated by Covarrubias are *Island of Bali* (1939) and *Mexico South* (1946).

COVENANT, in law, a specialty, or a contract under seal; a promise in a deed to do or not to do a certain act or that a given state of things does or shall, or does not and shall not, exist. The promise may be either expressed or implied. Express covenants are created by words that show the intent to so promise; whereas implied covenants or covenants in law are promises that are created by construction of the law in that certain words by operation of law carry with them the implication that certain promises were made even though not expressed. Covenant is also the name given to a form of action at common law for the recovery of damages for a breach of a specialty. See Deed.

COVENANT, in the Bible, an agreement or compact between two individuals, between God and an individual, or between God and the Jewish nation. An early covenant between individuals was made by Abraham and Abimelech (Gen. 21:27). The covenant between Jacob and Laban was confirmed by setting up a heap of stones (Gen. 32: 44–48). The idea of a covenant relationship between a person and God is found in God's command to Adam in the Garden of

Eden (Gen. 2:16, 17). God made two covenants with Noah (Gen. 6:18; 9:8–17), the latter being a promise that never again would a flood destroy the earth. Covenants were made with Abraham (Gen. 15:18; 17:2–21), with Isaac (Gen. 26:24, 25), and with Jacob (28:11–22). The most famous of the Old Testament covenants was that which God made with Moses on Mount Sinai (Exod. 19:5; 34:10, 27). The covenant on Sinai was actually a constitution for the Israelite nation in which God promised His presence and protection in return for their promise to observe and obey His laws. Thereafter the Israelites were the people of the covenant, and their history is a record of their observance of the compact with God. The destruction of Jerusalem in 586 B.C. and the exile of the Jewish nation were attributed to their disobedience to the covenant. The old covenant having thus been broken, Jeremiah wrote of a new covenant that would be put in the inward parts of the people (31:31–34). Ezekiel associated the new covenant with his hope of a Messiah (16:60, 62; 20:37; 34:25). In Christian theology Christ established a new covenant in His blood (I Cor. 11:25); Christ thereby becomes the latest covenant between God and His people.

COVENANT. See Ark of the Covenant; Title, *Covenants of Title.*

COVENANTERS, in Scotland a religious group of the seventeenth century bound by oath to defend Presbyterianism. The history of the group is marked by a series of covenants. When the Roman Catholic church was trying to re-establish its faith in Scotland, in 1581 during the Counter Reformation, a covenant pledging defense of Protestantism was adopted by the general assembly and approved by James VI. After Scotland and England were united under a common sovereign the Scottish Covenanters carried on a long struggle to protect their Presbyterian church system against episcopal innovations from the Anglican church. Under Charles I, Archbishop William Laud made a determined effort to reduce both England and Scotland to religious uniformity. The National Covenant of 1638 affirmed Scottish determination to resist. In the Bishops' Wars (1639–40) the Scots defeated the forces of Charles. In 1643 during the English Civil War the Covenanters entered into an alliance with the English parliament; by the terms of the Solemn League and Covenant, parliament agreed to establish Presbyterianism in England. This agreement was nullified after the defeat of Charles I because the Presbyterians of parliament were ousted from power by the Independents who dominated Cromwell's army.

In 1650 the Covenanters made an alliance with Charles II, who took an oath to uphold the covenant. Cromwell then marched his army into Scotland and defeated the forces of Charles. After the Restoration in 1660 Charles renounced the covenant. Episcopacy was restored, and ministers refusing to recognize the bishops were expelled from their churches. The Covenanters and their ministers then held services in the fields; when Charles tried to enforce church attendance there was an open rebellion, and a number of battles were fought. In spite of military defeat and savage persecution many of the Covenanters remained faithful to their covenants. The persecution finally ended after the Glorious Revolution of 1688 drove James II from the throne. An extreme group, called the Cameronians, refused to accept certain features of the new church and remained aloof from it. See Cameronian; Presbyterianism.

COVENT GARDEN, district of central London, England, in the City of Westminster, N of Charing Cross, between the Strand and Long Acre. Located in the Covent Garden district are the Royal Opera House; Bow Street police court; and the major vegetable, fruit, and flower market of London. The name derives from the Convent Garden of Westminster Abbey formerly located here.

BRITISH INFORMATION SERVICES

Art joined architecture in the reconstruction program at Coventry following World War II. Pictured is the statue of Godiva by Reid Dick, erected at Broadgate in 1949.

COVENTRY, city and county borough, central England, Warwickshire, 17 miles ESE of Birmingham. Coventry is an important industrial center noted for the manufacture of automobiles, aircraft, and bicycles. Other products include textiles, machinery, iron and steel goods, watches, chemicals, paints, construction materials, and printed matter. Coal is mined in the vicinity. Many of Coventry's notable ancient monuments were destroyed or severely damaged by air raids during World War II. The fourteenth century cathedral, fourteenth century Christ Church with its lofty spire, fourteenth century guild hall, sixteenth century Ford's Hospital, and other old buildings all suffered severely in the bombing. The fine cathedral was reduced to a shell. It is being restored in modern design. Other features of interest in the city include a Benedictine priory founded in the eleventh century by Earl Leofric and Lady Godiva, ancient city gates, and parts of the old city walls. The famous ride of Lady Godiva, with the Peeping Tom incident, traditionally occurred in Coventry (see Godiva). The city first developed as an industrial center through textile manufacturing. During the Middle Ages important fairs together with noted mystery and miracle plays were held in Coventry. Pop. (1951) 258,211.

COVERDALE, MILES, 1488–1568, English clergyman who made the first complete translation of the Bible into English, was born in Yorkshire, educated at Cambridge, and in 1514 was ordained a priest. He entered the convent of the Austin Friars at Cambridge and was much influenced by the ideas of the prior Robert Barnes, who was later burned as a heretic. Coverdale left the convent in 1526 and began to preach the doctrines of reform; soon afterward he fled to the Continent, where he spent the years to 1535 translating the Bible from Latin and Dutch into English. In that year the completed work, dedicated to Henry VIII, appeared at Zurich. He was befriended by Thomas Cromwell, who sent him to Paris in 1539 to supervise the printing of another edition of the Bible, known as the "Great Bible," which was to be used throughout England. Shortly

after Coverdale returned to England, Cromwell was executed for treason in 1540. In the years that followed Coverdale shuttled back and forth between his home and the Continent, depending upon whether his views were in or out of favor with the ruler of the moment. Finally in 1563, under Elizabeth I, he became rector of St. Magnus, but soon resigned that office because of his objections to vestments and to parts of the liturgy. He continued to preach as a secular priest until his death.

COVERED WAGON, a large, rugged wagon, with hoops on which a cover, usually of canvas, was fitted; an important factor in the settlement of the western United States. The Conestoga wagon, developed in Pennsylvania in the eighteenth century, was an early type (see CONESTOGA WAGON). Covered wagons of various kinds were especially useful in crossing the country west of the Mississippi River. Drawn by teams of horses, or more often oxen, the wagons carried families and possessions on the Oregon Trail, the Mormon road to Utah, and the overland road to the California gold rush. Covered wagons were also used by merchants on the Santa Fe trail, and later by freight companies in the West. For protection against Indians and mutual aid on the road, wagons usually traveled in caravans, under the government of an informal council of the older and more experienced men, and with guides who knew western trails. The wagons were formed in a circle or hollow square for safety at night, or for defense against Indian attack. Because the wagon beds resembled boats and the canvas covers connoted sails, these wagons were sometimes called prairie schooners.

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COVILHÃ, city, central Portugal, in the province of Beira Baixa and the district of Castelo Branco, 140 miles NE of Lisbon. Covilhã, an important woolen textile manufacturing center, has a school of textile technology. The city is also a tourist and winter sports center. Pop. (1950) 20,423.

COVINA, city, S California, in Los Angeles County, on the Pacific Electric Railroad and U.S. highways 60, 70, and 99; 20 miles E of Los Angeles. Covina has machine shops and processes citrus fruits. It is the site of California Baptist Theological Seminary. Pop. (1955 special census) 19,084.

COVINGTON, city, N central Georgia, county seat of Newton County, on the Central of Georgia and the Georgia railroads and U.S. Highway 278; 32 miles ESE of Atlanta. Covington has textile factories and lumber mills. Pop. (1950) 5192.

COVINGTON, city, N central Kentucky, county seat of Kenton County, on the S bank of the Ohio River SW of its junction with the Licking River, on the Chesapeake and Ohio and the Louisville and Nashville railroads and U.S. highways 25 and 42; across the Ohio River from Cincinnati, Ohio. Covington—Kentucky's second largest city—is part of the metropolitan area of Cincinnati, to which it is connected by bridges, including the first major suspension bridge, designed by John A. Roebling (1866). The city is a shipping center for many of Kentucky's products. One of the largest X-ray manufacturing plants in the United States is located here. Other industries deal with foundry and mill products, machine tools, packaging machines, electrical equipment, meat, alcoholic beverages, fruit, paper and other lumber products, tobacco, and petroleum refining. One of the city's outstanding buildings is St. Mary's Roman Catholic Cathedral. Covington was founded in 1815 and named after Gen. Leonard Covington, an officer in the War of 1812. The city has a manager form of government. It is the seat of Villa Madonna College. Pop. (1950) 64,452.

COVINGTON, town, SE Louisiana, parish seat of St. Tammany Parish, on the Bogue Falia River, the Gulf, Mobile, and Ohio Railroad, and U.S. Highway 190; 37 miles N of New Orleans. Covington is the center of an area producing berries, citrus fruits, timber products, and tung oil. Abita Springs State Park is located about 4 miles east. Pop. (1950) 5113.

COVINGTON, city, W Tennessee, county seat of Tipton County, on the Illinois Central and U.S. Highway 51; 37 miles NE of Memphis. Covington is a market center for an area producing cotton, livestock, and lumber. Pop. (1950) 4379.

COVINGTON, city, SW Virginia, in Alleghany County, but independent of it, in the Allegheny Mountains; on the Jackson River, the Chesapeake and Ohio Railroad, and U.S. highways 60 and 220; 38 miles NNW of Roanoke. The city has flour mills and manufactures rayon textiles and paper. Pop. (1950) 5860.

COVODE INVESTIGATION, a congressional investigation in 1860 into the use of patronage by the Buchanan administration. John Covode, a Republican representative from Pennsylvania, introduced the resolution for an investigation and served as chairman. The committee uncovered administrative weaknesses and irregularities in public printing contracts. The committee report was used by Republicans in the campaign of 1860.

ANHEUSER-BUSCH, INC.

Westbound Wagon Train on the Salt Lake Trail, a Painting of Pioneer Travel

COW. See Animal Husbandry; Butter; Cattle; Dairy Industry; Milk.

COWANSVILLE, town, SE Canada, in the province of Quebec, on the Yamaska River and the Canadian Pacific Railway; 13 miles from the Vermont border, and 46 miles SE of Montreal. Industries include rayon textiles, furniture, shoes, pottery, and wood fiber products. Pop. (1951) 4431.

COWARD, NOEL, 1899– , English actor, playwright, and songwriter, was born in Teddington, Middlesex, and made his first stage appearance in 1910. Coward's part in *The Vortex* (1924), which he wrote, established him as a star. The comedy *Hay Fever* (1925), the revues *This Year of Grace* (1928) and *Bitter Sweet* (1929), and the dramas *Private Lives* (1930), *Cavalcade* (1931), and *Design for Living* (1932) followed. During World War II, Coward wrote, directed, and acted in a film about the British navy, *In Which We Serve* (1942). He also wrote *Middle East Diary* (1943), based upon experiences while entertaining troops. Best known for his sophisticated comedies, Coward wrote some 45 plays and revues, including *Tonight at Eight-Thirty* (1936) and *Peace in Our Time* (1947). His *Blithe Spirit* (1942) was made into a motion picture in 1945, and *This Happy Breed* (1943) in 1944. Among his motion pictures were *The Scoundrel* (1934), *Brief Encounter* (1945), and *The Astonished Heart* (1950). Coward wrote two autobiographical prose works, *Present Indicative* (1937) and *Future Indefinite* (1954).

COWBIRD, any of several species of parasitic perching birds. These birds make no nests of their own but place their eggs in the nests of other birds for incubation. The most familiar species, the eastern cowbird, *Molothrus ater*, is among the more numerous of the birds of eastern United States and Canada. Other species are common in Central and South America. The eastern cowbird is small and glossy black, with a brown head and breast. It haunts fields and pastures, feeding upon insects stirred up by the cattle, a habit from which it derives its name. One spotted egg is laid in the nest of any smaller bird, especially song sparrows; other eggs are laid in different nests. When the young cowbird is hatched, it gains most of the attention of the foster parents; as a result the young of many songbirds are starved to death.

CHICAGO NATURAL HIST. MUS.
Cowbird

COWBOY, a man who works with cattle, especially one of the mounted workers in Texas and the Great Plains area in the period of the range cattle industry and since; an important factor in the development of the West, and a significant figure in the literature, art, and folklore of the United States. Cowboys, engaged in cattle fattening and driving, were known in the colonies, especially in the Piedmont region, in the eighteenth century.

The typical cowboy developed in Texas in the years following 1836, paralleling the development of herds of longhorn cattle and the use of the mustang or "cow-pony" to herd them on the open range. (See Longhorn; Mustang.) Cattle and horses of these types had developed in Mexico and Texas, and the cowboy adopted his costume and some customs and methods from the Mexican *vaquero*.

The great day of the cowboy came after the Civil War and lasted until about 1890. Cattle raised in Texas were driven or trailed north to the railheads, and gradually the range spread to the northern Great Plains. The trail was the great epic of the cattle industry, and a test of the endurance and skill of the men who made it. (See Cattle Drive; Chisholm Trail.) On the range cowboys had the task of caring for the cattle, making sure they were not stolen or strayed, and of periodically gathering them, separating them according to ownership, and branding them. (See Roundup.) The work was hard, requiring physical stamina and skill, great horsemanship, the use of the lariat, and courage and resourcefulness. The typical cowboy costume developed for use at work—the broad-brimmed hat for protection against sun and dust, the chaps against mesquite and brush, the neckerchief to cover the face in dust raised in storms or by the herd, the high-heeled boots adapted to the stirrups. Danger from Indians and from rustlers was common. Law and order were often lacking and the individual had to defend life and property.

USDA
Astride an alert pony, a cowboy keeps a watchful eye on stragglers and dogies at the Three-Circle ranch roundup, Powder River County, Mont., in Custer National Forest.

The settlement of the West, with its building of railroads, the opening of farms, and the fencing of the land, brought an end to the great drives and much of the free range. Cattle and the cowboy remained important, but the character of the industry and its chief worker changed. See Cattle Industry.

The actual historic work of the cowboy is only one portion of his significance. From very early times the cowboy attracted the attention of writers and artists, and the adventurous and picturesque aspects of his life were reported to eastern and European audiences, often at the expense of the facts. The development of the Wild West show and the rodeo (see Rodeos and Wild West Shows), and the early reminiscent accounts of cowboy life helped to create an American folk hero. Owen Wister's *The Virginian*, the novels of Zane Grey and others, and motion pictures with such figures as William S. Hart and Tom Mix further formed an image of the cowboy and a formula for "western" fiction that was widely popular and almost ineradicable. Radio, motion pictures, and the advent of television altered only details. A uniquely American figure, the cowboy had his Argentine counterpart in work and in folklore. (See Gaucho.) As a folk figure, the cowboy is unusual in that there is no mythical individual figure, such as Paul Bunyan or John

Henry; the cowboy *is* the figure. See FOLKLORE, *American Folklore;* RANCH; SOUTHWEST; WEST.

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COWES, urban district, S England, Hampshire, on the N shore of the Isle of Wight, on The Solent at the mouth of the Medina River, 11 miles SSE of Southampton. Included within the urban district is East Cowes on the right bank of the Medina River. Cowes is a minor port, resort, and yachting center. Shipbuilding and engineering are the principal industries. Cowes Castle, dating from the sixteenth century, is the headquarters of the Royal Yacht Squadron (founded 1856). Osborne House, east of Cowes, was the summer residence and death place of Queen Victoria. Pop. (1951) 17,154.

COWL, JANE, 1884–1950, U.S. actress, was born in Boston, Mass., and made her Broadway stage debut in 1903. Called the most beautiful actress of her time, she gave outstanding performances in such plays as *Within the Law*, *Common Clay*, *Romeo and Juliet*, *Anthony and Cleopatra*, and *Camille*. She wrote (with Jane Murfin) and acted in *Information Please*, *Smilin' Through*, and *Lilac Time*.

COWLEY, ABRAHAM, 1618–67, English poet, was born in London, and educated at Oxford and Cambridge universities. A remarkably precocious child, Cowley at 10 composed an epic poem, *Pyramus and Thisbe*, and two years later another, *Constantia and Philetus*. At the age of 20 he had published several volumes of poems and poetic dramas, all highly regarded by his contemporaries. Expelled from Cambridge in 1641 during the English Civil War, Cowley went to Paris where he became secretary to Queen Henrietta Maria. The poems written during his exile were mainly diatribes against Cromwell and Puritanism. In 1655 he returned to England as a Royalist spy, and was captured and imprisoned. Released on bail, he again escaped to Paris. After the Restoration he returned home, retired from politics, and devoted himself to the study of botany and philosophy. Cowley's fame as a poet did not long outlive him; later generations found his lyrics pompous, bombastic, and lacking in genuine emotion, despite their polished form. He is remembered chiefly for *Pindarique Odes* (1656), in which he introduced the rhetorical ode in irregular verse, a form much imitated by Dryden and other eighteenth century poets.

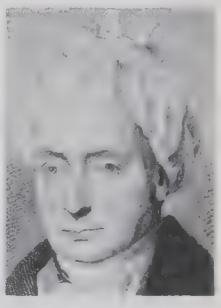
COW PARSNIP is a genus of tall perennial herbs belonging to the family *Umbelliferae*. Cow parsnips are found on damp ground and in moist woods in the Northern Hemisphere. The North American species, *Heracleum lanatum* grows to about 8 feet. It has hollow, ridged stems with whitish-green leaves. European cow parsnips, *H. Mantegazzianum*, grow to about 9 feet and have leaves 3 feet long; their white flowers bloom in clusters that may be 4 feet in width. Cow parsnips are propagated by seeds and division.

COWPENS, BATTLE OF, a brilliant American victory in the Revolutionary War, fought on Jan. 17, 1781, along the Broad River in South Carolina, near the present village of Cowpens. Gen. Nathanael Greene, the American commander in the South, sent Gen. Daniel Morgan to threaten the British post at Ninety Six. Lord Cornwallis, the British commander, sent Col. Banastre Tarleton against Morgan. Militia under Col. Andrew Pickens joined Morgan who finally took up a position at the "cowpens," so called because the area had been used for fattening cattle. Tarleton rashly ordered his troops, weary from the march, into battle. Morgan's men were formed in three lines, and, according to plan, the first two lines fired and fell back. The British were drawn on in pursuit, to be met by both gunfire and bayonet, followed by a cavalry attack on the right flank and the reformed militia from the first lines on the left. American losses were 12 killed and about 60 wounded of 970, while the British lost about 300 killed or wounded and 600 prisoners out of 1050 engaged. The victory raised American morale and seriously disrupted British campaign plans in the South. See MORGAN, DANIEL; REVOLUTION, AMERICAN.

Cowpens National Battlefield Site, an area of one acre, was established in 1929 and put under the administration of the National Park Service in 1933. There is a monument commemorating the battle.

COWPER, WILLIAM, 1664?–1723, English statesman and jurist, first Earl Cowper, was the eldest son of Sir William Cowper, a Whig politician. Made lord keeper of the great seal in 1705, and in the following year appointed a commissioner for the treaty of union between England and Scotland, he took a leading share in negotiations between the two countries. He became first lord chancellor of Great Britain in 1707, but following the fall of the Whig ministry in 1710 he resigned his office, which was later restored to him by George I.

COWPER, WILLIAM, 1731–1800, English poet, was born in Hertfordshire and educated at the Westminster school. Cowper studied law and practiced for a time, but was temperamentally unsuited for a legal career. Shy and retiring, and subject to moods of deep depression, he suffered a nervous breakdown in 1763; after 18 months in an asylum he was sent to the country to recuperate. In Huntingdon he met the Unwins, who took him in and treated him as a member of their family. After the death of Mr. Unwin, Cowper stayed with the family and moved with them to Olney, where he spent the next two decades writing the poems which were to make him (and the little village) famous. Cowper's early verses were mostly religious hymns, but at Mrs. Unwin's suggestion he turned to secular verse and produced such delightful satires as *Table Talk*, *The Progress of Error*, and *Conversation*, published in 1782 together with *Boadicaea* and *Verses Supposed to be Written by Alexander Selkirk*. Although not generally ranked among the greatest poets of English literature, he stood high among those who broke with tradition and led the way to a new style. His easy, simply written, often humorous poems were a refreshing change from the pomposity and artificiality of many of his contemporaries, the imitators of Alexander Pope. His deep feeling for nature and enthusiasm for humanity foreshadowed the writings of Burns, Wordsworth, and Shelley. His gentle, humane, and utterly unpretentious nature is clearly revealed in his letters, *Private Correspondence of William Cowper* edited by John Johnson, 1824, which are among the most charming and descriptive in the English language. Cowper suffered several mental breakdowns during his life, and the final one, probably caused by the death of his devoted friend Mrs. Gilpin, left him totally incompetent until his death a short time later. Among his well known works are *Olney Hymns* (1779), *The Task*, and *The History of John Gilpin* (1785). Cowper's last work, *The Castaway* (1798) is a darkly beautiful expression of his melancholy.



William Cowper

COWRIE or **COWRY** is a genus of about 200 species of gastropods (see GASTROPODA) that inhabit the warmer oceans. Several hardy species, including the brownish *Cypreae exanthema*, are found along the southeastern coast of the United States. Most cowries have brightly colored, highly polished oval shells that are well inflated. The long opening is narrow and toothed on both sides. Most cowries are very small

but certain species may reach lengths up to 4 inches. Some South Pacific tribes use cowrie shells as money. Fossil cowries are known from the Jurassic period. See GEOLOGIC TIME.

COWSLIP, any one of several plants belonging to the primrose family, *Primulaceae*, and the borage family, *Boraginaceae*. Cowslips, *Primula veris*, are sometimes called primroses because of their showy pink flowers. American cowslips or shooting stars, genus *Dodecatheon*, are also members of the primrose family, and are noted for their showy rose-colored flowers and lance-shaped leaves. Virginia cowslips or Virginia bluebells, *Mertensia virginica*, of the borage family, have pale blue or purple flowers 1 inch long. All of the cowslips are cultivated in the United States but they also grow wild in moist woods and on hillsides.

COW TREE, any one of several tropical or subtropical trees that yield a milky juice or latex, suitable for use as a beverage. The best known of these trees is *Brosimum utile*, of the same family, *Moraceae*, as the mulberry and breadfruit. This tree, described under the vernacular name of *palo de vaca*, has dry, leathery leaves; its large woody roots can scarcely penetrate the stony soil. For several months in the year not a single shower moistens its foliage. Its branches appear dead and dried. Yet when the trunk is pierced there flows from it a sweet and nourishing milk. It is at sunrise that this vegetable fountain is most abundant. The natives are then to be seen hastening from all quarters with large bowls to receive the milk. The milk, obtained by incisions in the trunk, is glutinous, moderately thick, free from all acrimony, and of an agreeable and balmy smell. Another cow tree is a species of *Mimusops* of the family *Sapotaceae*, from Costa Rica and Guatemala. Drinking the latex of these trees seems to have no ill effect. H. W. RICKETT

COX, DAVID, 1783–1859, English painter, was born near Birmingham. Apprenticed to a locket maker, he studied art at night and soon began to work as a scene painter. In 1804 he went to London, where he taught and did sketches for small sums. In 1813 he was elected to the Society of Painters and Water Colorists, and in the following year published *Treatise on Landscape Painting*. He began to paint in oils, 1839, quickly demonstrating a talent comparable to Constable's, although he attained little recognition in his lifetime. His best work is virile and simple in its evocation of mood. Typical are the drawings, *Lancaster Sands*, *The Flood at Corwen*, and *Windsor Park;* and the oils, *Vale of Clwyd*, *Peace and War*, and *The Skylark*.

COX, JACOB DOLSON, 1828–1900, U.S. soldier and cabinet officer, was born of American parents in Montreal, Canada. He was graduated from Oberlin College, 1851, practiced law at Warren, Ohio, and served in the state senate. Commissioned brigadier general of volunteers in 1861, Cox commanded in what became West Virginia until ordered to Virginia in August 1862. He fought at South Mountain and Antietam, becoming a major general of volunteers. He later returned to West Virginia, commanded the district of Ohio, and served in the Atlanta campaign, at Franklin and Nashville, and in North Carolina in 1865. Resigning from the army in 1866, he was elected governor of Ohio. Cox was secretary of interior under Pres. U. S. Grant, 1869–70, and advocated civil service reform. Breaking with Grant, Cox resumed law practice and in 1873 became president of the Wabash Railway. He served one term in Congress, 1877–79. Cox was dean of the Cincinnati Law School, 1881–87, and president of the University of Cincinnati, 1885–89. He wrote several important books on the military history of the Civil War. E. B. LONG

COX, JAMES MIDDLETON, 1870– , U.S. newspaper publisher and political figure, was born in Jacksonburg, Ohio. Cox was a printer, taught school, and was a reporter for the *Cincinnati Enquirer* before he bought the *Dayton Daily News*, 1898, first in a chain of newspapers which he built up in the half-century following. Cox was a congressman, 1909–13. As governor of Ohio in 1913–15 and in 1917–21, he introduced such reform measures as a workmen's compensation law, and a law eliminating sweatshops. In 1920, as the Democratic party's candidate for president, he was defeated by Warren G. Harding. He wrote *Journey Through My Years* (1946), an autobiography.

COX, KENYON, 1856–1919, U.S. painter and muralist, was born in Warren, Ohio. A member of the Society of American Artists after 1882, he helped decorate the buildings of the Columbian Exposition. He also did murals for the Library of Congress, the Minnesota State Capitol, and the Appellate Court of New York City. He wrote *Old Masters and New* (1905), *Painters and Sculptors* (1907), and *The Classic Point of View* (1911).

COX, PALMER, 1840–1924, Canadian artist and author, was born in Granby, Que., but lived most of his life in the United States. A resident of New York after 1875, he developed his idea of "The Brownies," little sprites in the costumes of all nations, whose experiences he described in verse illustrated with his own drawings. *The Brownies, Their Book* (1887) was followed by six or seven other volumes in the series.

COXEY'S ARMY, a band of several hundred unemployed, led by Jacob S. Coxey from Massillon, Ohio, to Washington, D.C., in April 1894, as a petition for legislation to remedy the conditions following the panic of 1893. Coxey proposed the issuance of paper money and a federal program of roads and public works. An associate, Carl Browne, conceived the idea of a "living petition" to Congress, believing that thousands would join in the march. About 500 arrived in Washington in time for a May Day parade and demonstration. When Coxey began to speak from the Capitol steps, he was arrested for having trampled on the grass in violation of an ordinance; his followers were disbanded. Other armies, notably that led by Charles T. Kelly from San Francisco, made their way across the continent. One group seized trains to transport them and some marchers were arrested on the way. Only remnants reached Washington, where the authorities usually arranged to pay their way home. The "army" and "General Coxey" were the subject of a great deal of ridicule, but were symbols of the popular unrest created by economic dislocation and distress.

COYOACÁN, city, central Mexico, in the Federal District, about 7 miles S of Mexico City, of which it is a residential suburb. The city was the site of a pre-Aztec village. It was the first seat of the Spanish government and contained the palace of Hernán Cortés. In the city are the sixteenth century church of San Juan Bautista; the Casa de Alvarado, at one time a colonial mansion and now a museum; and a Dominican monastery. Pop. (1950) 46,031.

COYOTE, or prairie wolf, is a comparatively small wolflike animal found from Alaska to Costa Rica and

The coyote is a constant menace to small domestic animals throughout the Great Plains of North America. As wily as it is cowardly, it has survived all extermination efforts.

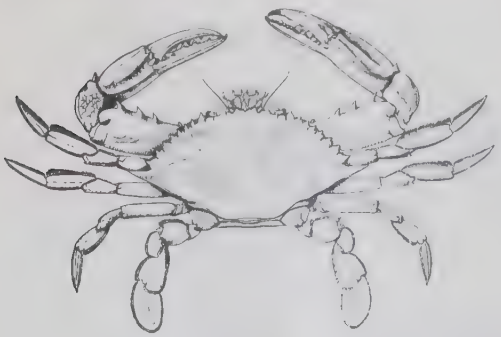
NEW YORK ZOOLOGICAL SOC.

in the United States from the Pacific Coast to Michigan and Ohio. With a dense coat and large, bushy tail, the animal resembles a shepherd dog. The upper parts of the heavy coat are a combination of buff, gray, and black, with the exception of the ears, muzzle, and outer legs, which are yellow. The underparts are whitish. Males usually measure about 4 feet in length and weigh between 20 and 30 pounds; the females are somewhat smaller. There are approximately eight species of coyotes. The prolonged howl of the coyote is a familiar sound in the western regions of the United States. Coyotes mate for life, and 6 to 12 pups are born two months after mating. The young remain with their parents until they are about six months old. Contrary to popular belief the main food of coyotes is not domestic animals, but rodents, reptiles, and insects; coyotes also eat fresh fruit and vegetables. The natural enemy of the coyote is its near-relative, the gray wolf.

COYPU, a large South American rodent related to the porcupine. This animal, genus *Myocastor*, lives in swamps, marshes, and sewers, feeds on aquatic plants, and has habits similar to those of the beaver, except that it does not build dams. Its fur, when freed from the long and stiff outer hairs, resembles beaver, and is valued by furriers. For this reason the coypu has been introduced into Europe and the United States, especially Louisiana and New Jersey. Animals 2 feet in length and weighing 9 pounds are not uncommon. The toes on the hind feet are webbed.

COZZENS, JAMES GOULD, 1903– , U.S. author, was born in Chicago, Ill. He wrote his first novel, *Confusion* (1924), while a student at Harvard. In 1949 he was awarded the Pulitzer prize for *Guard of Honor* (1948).

CRAB, any one of numerous 10-legged, hard-shelled marine or land animals (see CRUSTACEA) that are noted for their ability to regenerate lost appendages. Crabs are closely allied to the crayfish (see CRAYFISH) and to the hermit crabs. They differ from hermit crabs in that their abdomen is small and turned under. Crabs vary in over-all size from 1 to 4 feet. Largest is the Alaska king crab, measuring about 4 feet from tip to tip and weighing about 12 pounds. In the more typical forms, such as the blue, or edible, crab, *Callinectes sapidus*, the body is depressed and is covered by a strong shield or carapace. The main muscle, which is the edible portion of the crab, is located in the cephalothorax. The front walking legs contain stout heavy pincers at the tips and are so curved that they fit closely to the margin of the carapace; the other four pairs of walking legs support the entire weight of the body. The abdomen is only slightly developed and has no tail fin. It is permanently turned in and has rudimentary appendages only. In accordance with the sedentary mode of life, the antennae are short, instead of long as in the lobster (see LOBSTER), and the eyes are placed in sockets into which they can be retracted.



U.S. FISH AND WILDLIFE SERVICE

The blue crab is commercially the most important species in the United States. Immense quantities are taken from Cape Cod southward, particularly in the Chesapeake Bay.

Habits. Like other crustaceans, crabs periodically cast off their shells. The molts are most frequent in youth when the rapid growth of the body conflicts with the shell's rigidity. The new shell, at first very soft, requires several hours or days to harden.

Crabs are generally scavengers and cannibals, but the land species are also vegetarian in diet. Crabs are great fighters. Wily in averting danger, they move sideways instead of forward, often with great rapidity. They vary greatly in color, with green, blue, and gray being the most common hues. They are of economic importance as a food in many parts of the world and are taken in wicker traps baited with meat, or in shallow baited nets.

The blue crab is the most commercially important species to the United States. Found in waters from Massachusetts Bay to northern South America, it is taken for market in immense quantities, often immediately after molting and before the new shell has hardened. At this time it is called a soft-shelled crab. Blue crabs are hatched after an incubation period of about 15 days. During incubation the mass of about 2 million eggs, called a sponge, is carried on the underside of the female.

Two free-swimming stages of young crabs are recognized. The first stage, called zoea, bears little resemblance to the adult. During the zoea the young crab molts about six times. The second, or megalops, stage involves no molting and the young crab is able to walk on the bottom of the sea for the first time. In this stage the young crab begins to have an adult appearance although it is only about .04 inch in width. After a series of about 15 molts the adult crab is formed. The average adult blue crab's body size is about 3 to 6 inches. Crabs mate during the summer at the age of 12 to 14 months. Eggs are laid about two months after mating if mating occurs early in the summer; if mating occurs later, the eggs are carried by the female until the following spring. Life expectancy of blue crabs is three to four years. Other relatively important species of crabs include the Alaska king, or Japanese crab, genus *Paralithodes;* the dungeness crab of the Pacific Coast, *Cancer magister;* the rock crab, *C. irroratus;* and the spider crab, *Libinia emarginata.* (See FISHERIES.) Numerous fossil species are known from American Cretaceous and Tertiary deposits.

CRAB APPLE, any one of various species and hybrid varieties of apples that have been developed for the beauty of their flowers and fruit. While many species resemble the cultivated apple more or less closely, others vary in size from the Sargent crab apple, *Pyrus Sargentii*, which is a low shrub, to the Siberian, *P. baccata*, which grows to a considerable height. White or pink are the commonest flower colors but salmon-pink, deep rose, and light purple are also known. The fruit, hard and astringent, makes excellent preserves, jellies, and high-grade cider. Asiatic species are primarily ornamental.

There are two main groups of flowering crabs: the so-called prairie crabs, developed from native North American species, and the Oriental crabs, largely the result of importations from the Orient by the Arnold Arboretum of Harvard University. The outstanding variety among the prairie crabs is the Bechtel, a double-flowered variety originally discovered growing wild in the Midwest. It has pale salmon-pink flowers, much like small tea roses, which are deliciously fragrant. Like all the prairie crabs, the Bechtel is subject to a rust that is transmitted to it by the native cedar, *Juniperus virginiana*, and is difficult to grow satisfactorily where such trees are common. The Oriental crabs are immune or highly resistant to this disease. The Arnold and the Floribunda are outstanding varieties. Hybrids with the Turkestan apple have produced numerous varieties with rose or purple flowers and reddish foliage. The fruits of the Oriental varieties vary in size from smaller than a pea to nearly as large as cultivated apples. Some of these varieties,

CHICAGO NATURAL HISTORY MUS.

Prairie Crab Apple in Bloom

notably the Toringo crab, are even more beautiful in fruit than in flower. A few are planted as game foods.

Many of the flowering crab apples do unusually well in eastern North America, and large public collections have been assembled at several points, notably Waterworks Park in Des Moines, Ia., the Morton Arboretum in Lisle, Ill., the Arnold Arboretum in Boston, Mass., and the parks of Rochester, N.Y. EDGAR ANDERSON

CRABBE, GEORGE, 1754–1832, English poet, was born in Aldeburgh, Suffolk. After studying surgery in London he became assistant to an Aldeburgh surgeon, but in 1780 went to London to try his luck at a literary career. He was befriended by Edmund Burke, who arranged for the publication of his first book of verse, *The Library* (1781). Having taken church orders, he became curate at Aldeburgh and later was chaplain to the Duke of Rutland. Crabbe's books include *The Village* (1783), *The Newspaper* (1785), *The Parish Register* (1807), and *The Borough* (1810).

CRAB GRASS, a coarse annual plant common in the United States. Common crab grass, *Digitaria sanguinalis*, grows to about 4 feet. Its flowers are arranged in three to six reddish brown spikes. In the South it is often considered a good hay crop; in gardens and lawns, however, it is detrimental to other plants. The grass can be eradicated only through the use of selective weed killers, by handweeding, or by crowding the weed out with a thick turf. The weed killer 2, 4-D is not effective in controlling crab grass. See GRASS.

CRAB NEBULA. See TAURUS.

CRAB PLOVER is a long-legged shore bird that inhabits the coasts of the Red Sea and Indian Ocean. It is about 16 inches long, black and white in color, and has long pointed wings. It lays a single large white egg in a hole dug in the sand. A member of the family *Dromadidae*, the crab plover, *Dromas ardeola*, feeds on crabs and other seashore animals.

CRAB SPIDER, any one of several species of webless spiders belonging to the family *Thomisidae*. The name is taken from the spider's crablike body and its ability to walk sideways or backward. The two pairs of front legs are stouter and longer than the back ones. A well known species is *Misumena calycina*, which is yellow or white marked with a red band on the abdomen.

CRABTREE, LOTTA, 1847–1924, U.S. actress, was born in New York City. She made her first appearance on the stage at Petaluma, Calif., at the age of 10, acted with her mother in variety, and in 1864 made her first New York appearance at Niblo's Garden. Her first great success was as Little Nell in *Little Nell and the Marchioness*. Her forte was comedy.

CRACKER, a dry, crisp biscuit. Cracker making, a highly mechanized procedure, is an important part of the baking industry in the United States. Baking companies must adapt their product to regional tastes—a white, flaky cracker is preferred in the eastern United States, a browner cracker is favored in the South and Far West, and a crisp, white product is popular in the Middle West. A sponge mix, containing flour, yeast, and water, is blended by a spindle mixer in a large trough and permitted to ferment for about 19 hours. More flour, sugar, salt, soda, shortening, and other ingredients are added and the dough is kneaded and permitted to ferment for six more hours. It is run through a set of rolls from which it emerges as an extremely thin ribbon. A steel cutting machine cuts and punches holes in the dough, and salt is thrown on the surface by a rotating brush roll. The crackers are then baked on a wire frame that passes through a long oven (often 200 feet) at temperatures ranging from 600°F in the entering zone to 300°F at the final stage. The baking process takes only 160 seconds. A breaking machine snaps the continuous sheet into strips during a cooling period of two or three minutes as the crackers pass on to be packaged. See BAKING.

CRACKER STATE. See GEORGIA.

CRACKING, PETROLEUM. See GASOLINE; PETROLEUM, *Increasing Yield of Gasoline*.

CRACKING PROCESS. See PETROLEUM.

CRACOW. See KRAKÓW.

CRAFTON, borough, SW Pennsylvania, in Allegheny County, on the Pennsylvania Railroad and U.S. highways 22 and 30, 4 miles W of Pittsburgh, of which it is a residential suburb. Crafton's industries include the manufacture of paper products and stoves. Pop. (1950) 8006.

CRAFT UNION. See LABOR UNION.

CRAG AND TAIL, a glaciated hill-like drumlin (see DRUMLIN) consisting of the crag, a bold and precipitous front, which faces in the direction from which the ice came and has an ice-smoothed rock surface; and the tail, a gently sloping surface composed of ground moraine. The structure owes its origin to the juxtaposition of rocks of variable degrees of durability, the harder rocks having resisted denudation and so protected the more readily eroded rocks. Crag and tail phenomena are caused by glacial erosion and accumulation. A well-known example is the Castle Rock of Edinburgh. Similar forms are common in other parts of the Scottish lowland.

CRAIG, EDWARD GORDON, 1872– , English stage designer, producer, and actor, was born near London. Son of Ellen Terry, he made his acting debut in one of her plays in 1889. As set designer and producer he advocated simplification of scenery and unification of production. In 1908 he founded *The Mask*, a theatrical journal, and in 1913 founded the influential School for the Art of the Theater in Florence, Italy. His writings, perhaps his most important contribution to theater art, include *Art of the Theatre* (1905), *On the Art of the Theatre* (1911), *Theatre Advancing* (1921), and *Ellen Terry and Her Secret Self* (1931).

CRAIG, MALIN, 1875–1945, U.S. general, was born in St. Joseph, Mo. He was graduated from West Point, served in the Spanish-American War and in the Boxer Rebellion, and during World War I rose to chief of staff of the American Expeditionary Forces in Germany, 1918–19. He was commandant of the Army War College and army chief of staff, 1935–39.

CRAIOVA, city, SW Rumania, in Walachia, in the province of Dolj, on the Jiu River and the Timişoara–Bucharest railroad, 120 miles SW of Bucharest. Features of interest are sixteenth and seventeenth century churches, a museum of early relics, a national theater, a university founded in 1950, and a large park. Craiova is the center of a region noted for excellent cereal grains. There are flour mills and tanneries and confectionery, soap, candle, textile, and cordage plants. Vinegar, ceramics, furniture, agricultural and industrial machinery, ironware, and chemicals are other products. Craiova was an important commercial center before 1300. During World War I the city was captured by the Germans and during World War II by the Soviets. Pop. (1956) 96,929.

CRAM, RALPH ADAMS, 1863–1942, U.S. architect and writer, was born in Hampton Falls, N.H., studied at Westbridge Academy and in Europe, and in 1889 began practice as an architect. An authority on Gothic architecture, Cram designed numerous churches and school buildings in the United States and Canada, many of them in neo-Gothic style, and served as supervising architect for Princeton University and as professor of architecture at Massachusetts Institute of Technology. Apart from his architectural publications, he wrote *Convictions and Controversies* (1935), and *The End of Democracy* (1937).

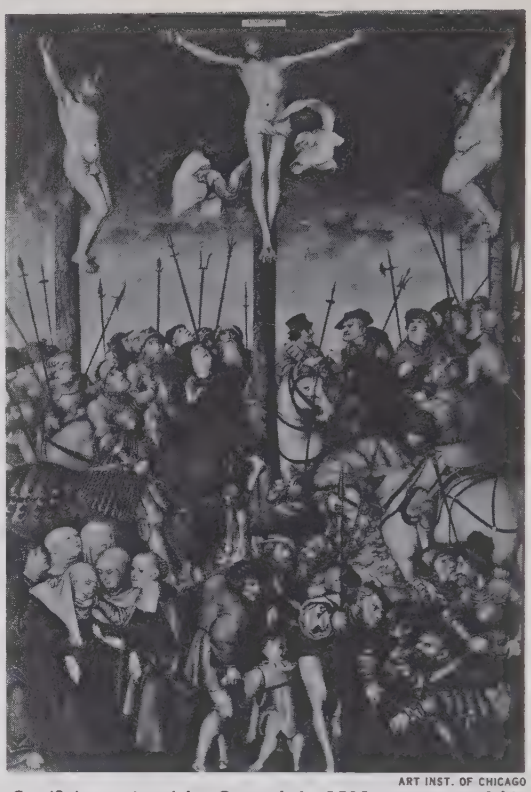
CRAMP, a strong, painful, involuntary contraction of most or all of the fibers of a muscle (see Muscle) which may be of either the skeletal or the visceral type. A skeletal muscle in the throes of a cramp feels hard and knotty. Often the leg or arm is drawn up by the contracting muscle. Pressure on the muscle may give relief, and brisk rubbing or sudden extension of the limb may relax the spasm. Cramps that affect muscles used excessively in a certain occupation are termed professional cramps. Examples of this type of cramp include writer's cramp, typist's cramp, and musician's cramp. Cramps may be associated with a disease such as tetanus (see Tetanus), or may follow violent exercise. In swimmer's cramp the circulation of blood to the extremities is disturbed by cold water, resulting in the cramp. When so seized, the swimmer should float on his back and forcibly knead the affected muscles.

Smooth, or visceral, muscle is also subject to cramps, a common example being those cramps associated with menstruation. Displacements of the uterus, constriction of the cervix, disease of the reproductive organs, disorders of the endocrine glands, and psychoneurotic states are possible causes of visceral cramps. The severe pains in the abdomen and limbs called heat cramps are caused by a deficiency of salt in the muscular tissue.

CRAMPTON, THOMAS RUSSELL, 1816–88, English civil engineer, was born in Broadstairs, Kent. After serving as an assistant to Sir Marc Brunel, 1839–44 he was associated with Sir Daniel Gooch, under whose direction he prepared drawings for the first locomotive of the Great Western Railway. In 1848 he designed an engine known as the *Liverpool*, which served as a pattern for locomotives operated for about 40 years on the railroad lines of the Compagnie du Nord in northern and eastern France. In 1851 Crampton laid the first practical submarine telegraph cable between Dover and Calais, helped install the Berlin waterworks, and directed construction of the Smyrna Railway (Turkey) and the Varna Railway (Bulgaria).

CRANACH, LUCAS, 1472–1553, German painter, was born in Kronach, Upper Franconia. Little is known of his family background or early life, but about 1504 his paintings attracted the attention of Duke Frederick (the Wise), elector of Saxony, and Cranach became court painter at Wittenberg. From that time on his life was a busy and prosperous one; he painted several altarpieces, dozens of portraits, and many mythological scenes for the duke. He was at various times a bookseller, pharmacist, burgomaster, and ambassador, and played an active role in the Lutheran reform movement. He also ran a printshop given him by the duke, and it was on Cranach's presses that Martin Luther printed his revolutionary pamphlets.

Cranach is remembered chiefly as a portraitist, and history is indebted to him for many likenesses of Luther, Melanchthon, and other leaders of the German Reform. His figure groups have been called stiff and grotesque, and it is true that they bore no resemblance to those of the Italian school of that time; but there is a certain naïve, almost comical charm about his pagan goddesses who, entirely unconcerned with their own nudity, look quizzically out of mythological allegories at the spectator. Cranach's work



ART INST. OF CHICAGO

***Crucifixion,* painted by Cranach in 1538, was one of his better-known religious pictures. He was best known for his portraits of Luther and other German Reform leaders.**

was long neglected, but twentieth century "modernists" found his attenuated figures (distorted in order to achieve plasticity of design) and his brooding, almost surrealistic landscape backgrounds quite in sympathy with their own artistic aims. Among Cranach's better known works are *Jealousy* (1534); *The Fountain of Youth* (1546); and the Stadtkirche altarpiece (1555) at Weimar.

CRANBERRY, the deep-red tart fruit of plants of the genus *Vaccinium*, especially *V. macrocarpon*, native

USDA

Cranberry Vine with Root System and Berries

of North America. The plant is a trailing shrub with small oval leaves and pinkish flowers. The fruit is a firm, red, globose to oblong or bell-shaped berry about three-fourths inch in diameter, which grows on a slender stem. It ripens in September and October. There are two principal species, the small *V. oxycoccus*, and the large *V. macrocarpon*. The small cranberry is found in North America, Europe, and Asia; it is sparingly cultivated in the Old World. The large cranberry, which is native to acid swamps in the cooler parts of the United States and Canada, is the one extensively cultivated in the United States.

The growing of cranberries in the United States is centered in Massachusetts, where the industry started and which leads in production; New Jersey, Washington, Wisconsin, and Oregon are important cranberry regions. Nova Scotia is also an increasingly important cranberry center.

Many varieties of cranberry are now in cultivation, all selected from wild plants. These varieties differ in shape, size, color, productiveness, time of maturing, and adaptation to different soils. The Early Blacks and the Howes are the ones generally found in cultivation. These two varieties originated in the Cape Cod region and together comprise about 50 per cent of the berries harvested in the cranberry states.

The requirements for cranberry cultivation are level land in a sandy region; water for flooding; good drainage; and comparative freedom from frosts. The best soil is one of peat with sand underneath, both superimposed on clay. The vines—cuttings of 8 or 10 inches—are planted about 12 inches apart, with 3 or 4 inches exposed above ground. The crop is largely handled by co-operative associations and forms an increasingly important industry in the United States, where the yield is more than 60,000 tons annually. For table use cranberries are usually cooked; they may be made into sauce or jelly or used as a filling for pies and tarts. Important insect pests include the blackheaded fireworm, *Phopobota naevana*, that may be controlled by spraying with DDT; the fruitworm, *Mineola vaccinii;* and the tipworm, *Dasyneura vaccinii*.

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CRANBROOK, city, SW Canada, in the province of British Columbia, at the foot of Mount Baker, on the Canadian Pacific Railway; 35 miles north of the Montana border, 132 miles SW of Calgary, Alta. Cranbrook, situated in a mining region, is a railroad division point and has a lumbering industry. The city was founded in 1897. Pop. (1951) 3621.

CRANE, HAROLD HART, 1899–1932, U.S. poet, was born in Garretsville, Ohio, of well-to-do parents whose unstable temperaments provided an unhappy atmosphere for the shy boy. His school days in Warren and later in Cleveland, Ohio, were painfully lonely. He began writing poetry at 14 and in 1916 saw some of it in print; this convinced him that poetry was to be his life's work. He left high school that same year and with his mother, who had separated from her husband, went to the Isle of Pines. By 1917 he was back in New York where financial aid from his father enabled him to engage in tutorial studies preparatory to entering Columbia University. Although he never entered the university, he did make contact with a larger world of poetry than he had known before. He studied the work of other poets, analyzed Marlowe, Donne, and Rimbaud, and was drawn at the same time to Whitman, Melville, and Sherwood Anderson. The years 1918–25 brought maturity to his own style, along with devastating economic and emotional problems. He worked intermittently at various jobs—shipyard riveter, confectionery warehouse packer, newspaper reporter, and advertising copywriter—and wrote poetry during the evenings under the double stimulation of alcohol and music. During the winter of 1925–26, while wintering in an artists' colony at Patterson, N.Y., Crane began what was to be his greatest work, *The Bridge* (1930), intended to recreate the main forces in the development of American civilization. In the fall of 1926 his first collection, *White Buildings*, was published. *The Bridge* was not finished until 1929 and then, after a period of economic and emotional desperation, Crane went to work at Chagrin Falls near Cleveland, where for a short time he led a relatively happy and temperate life. In 1931, armed with a Guggenheim Fellowship, Crane went to Mexico intending to do a poem on the conquest. Inspiration did not come and, although financial security seemed sure, thanks to the death of his father in June 1931, Crane's degradation reached new depths. In the spring of 1932 he set sail for New York, but committed suicide by jumping overboard shortly before noon, April 26, 1932. Posthumously published were his *Collected Poems* (1933). Critical opinions of Crane have exhibited wide variance, but despite his obscurity and relatively small output he came to be considered one of America's most important twentieth century poets. His work is most distinguished for its powerful lyrical intensity and for the variety and expressiveness of its imagery.

Rachel Gilbreath

CRANE, STEPHEN, 1871–1900, U.S. writer, was born in a Methodist parsonage in Newark, N.J., the fourteenth child of Rev. Jonathan Townley Crane and Mary Peck. After attending the Hudson River Institute, 1887–1889, Crane attended Lafayette University for a year, where he shocked his English professor by declaring that Tennyson's poetry was "swill." Thereafter he spent a year at Syracuse University and played shortstop on the varsity baseball team. His formal education ended with his mother's death in 1890 and he became a struggling newspaper reporter in New York; his chosen vocation provided Crane rich opportunities for observation in places as varied as New York's Bowery, Texas, and Mexico in 1895, Cuba in 1896, and Greece, where he covered the Turkish war in 1897. In 1898 he married Cora Taylor and lived with her for a time in England. There he became a friend of Joseph Conrad. He died of tuberculosis at Badenweiler, in the German Black Forest, where he had gone in the hope of improving his health.

Crane's literary reputation rests upon a few poems, several short stories, and two novels—*Maggie; A Girl of the Streets* (1893) and *The Red Badge of Courage* (1895). *Maggie*, published with $700 borrowed from the author's brother, has been called the first naturalistic American novel. An honest picture of the brutal life of the New York slums, the book was such a novelty when it appeared that it did not sell at all until after the success of *The Red Badge of Courage*. *The Red Badge* itself was remarkable in both substance and technique, being an acute psychological study of the raw army recruit in action, written consistently from the point of view of the desperate soldier. *The Black Riders and Other Lines* (1895) and *War is Kind* (1899) represent Crane's poetry, which is regarded as a link between the work of Emily Dickinson and the imagists of 1910 (such as Amy Lowell). Of Crane's short stories, the best is *The Open Boat* (1898). A master of irony, and above all a disinterested artist, Crane aimed at complete honesty of treatment by writing with economy, restraint, and respect for the reader's point of view.

Rachel Gilbreath

CRANE, WALTER, 1845–1915, English illustrator, was born in Liverpool. Largely self-taught, he was influenced by Botticelli and the ideas of William Morris. Classed as a member of the pre-Raphaelite group, his paintings include *The Chariots of the Hours* and *The Roll of Fate*, but he is best known for his illustrations for Spenser's *Faerie Queene* and several of Shakespeare's plays, and for his drawings for children's books. He wrote *The Bases of Design* (1898) and *Line and Form* (1900).

MILWAUKEE JOURNAL

African Crowned Cranes, Adults and Chick

CRANE, a large water bird related to the rails and bustards, about 14 species of which constitute the family *Gruidae*. The greater number of cranes are confined to the Old World; the tallest North American bird is a crane. All species are long-legged and long-necked. Their heads are partly naked and sometimes tufted; the beak is longer than the head and is straight and compressed. The wings are short but powerful, the tail short. The feet have four toes each, of which the posterior toe (hallux) is elevated and bears a sharp claw. The female lays two olive brownish eggs.

The best-known crane is the European common crane, *Grus grus*, which is about 4 feet high, gray in color, with throat and head almost black. The two foremost American species are the nearly extinct whooping crane, *G. americana*, which is white with a dull red cap, and the sandhill crane, *G. mexicanus*, which is somewhat smaller and a slate gray in color, although the young are usually brown. The whooping crane breeds in Canada and overwinters in Texas. The sandhill crane feeds on fish, frogs, and insects, nests upon the ground, and utters raucous cries. The demoiselle crane, *G. vipio*, and the handsome African or balearic crowned crane, *Balearica pavonina*, are common species in the warmer parts of the Old World.

CRANE, a device for lifting heavy loads and moving them from place to place. Cranes are made in many forms, but all employ block and tackle arrangements and winding drums to raise their loads. Modern cranes are developments from simple hoists and capstans, which date back to early times. See Block and Tackle; Capstan; Hoist.

Power for moving cranes may be supplied by hand, gasoline engine, diesel engine, steam engine, or electric motor. Diesel engines have become increasingly popular because of their economy. The modern trend toward mounting cranes on crawler tracks and truck bodies has given them almost unlimited scope in material-handling work. Cranes can be classified broadly as rotary, traveling, and fixed-base. Some, however, are combination types.

Rotary Cranes

The Jib Crane was one of the earliest types and is still used in such places as machine shops and foundries to lift forgings, castings, and other objects too heavy for manual handling. It consists of a vertical post from which a horizontal "jib" or arm extends. Traveling along the jib on wheels is the hoisting unit, which may be operated by hand, electric power, or air power. A structural column of the building often serves as the vertical post. When the jib is pivoted directly to the post its radial movement is restricted to something less than 180 degrees, a factor often overcome by mounting the jib on rollers so that it can make a complete revolution around the post. Jib cranes sometimes are mounted on ships or scows for marine construction and salvage work.

The Crawler Crane is the most versatile type, having great mobility even over rough ground. Basic parts are a crawler chassis surmounted by a rotating frame upon which are mounted the power plant, the hoist drums, and an inclined boom. The boom is hinge-connected to the front of the frame and suspended by wire rope running through pulleys to a hoist drum. Hoisting is accomplished by wire rope that runs from another hoist drum through pulleys on top of the boom and then through the pulleys of a suspended block that has a hook on it. The hook is attached to the load being raised. A counterweight at the rear of the crane balances the force exerted at the front while raising the load. The frame can rotate in a complete circle. This type of crane is used extensively in construction work, logging, and demolition.

The Truck Crane is a rotary crane mounted on an automotive-type chassis with rubber-tired wheels. Its superstructure is similar to that of the crawler crane. It can travel faster than the crawler but is less adaptable to rough ground. When heavy lifting is done, outrigger braces must be used to prevent tipping.

The Locomotive Crane is a rotary crane mounted on a railroad car. Because it must travel on rails its range of action is restricted to longitudinal movement

Crawler-type cranes are particularly useful on big earth-moving jobs. Shown at work in a Tennessee clay pit is one equipped with a 75-foot boom and 1¼-yard dragline bucket.

LIMA LOCOMOTIVE WORKS, INC.

A powerful overhead traveling crane picks up heavy girders at a Pennsylvania steel plant. Widely used in industrial and power plants, such cranes can lift loads of 400 tons.

BETHLEHEM STEEL CO.

and to the reach of its boom. The hoisting machinery in its cab is much like that of crawler and truck cranes, although the locomotive crane is more likely to be driven by steam power. Gasoline and diesel engines are also used. Locomotive cranes range in capacity from 5 tons to 250 tons. They are used for railroad yard work and for construction and repair of bridges and track. When lifting heavy loads they are steadied by outrigger beams.

Traveling Cranes

The overhead traveling crane consists of a steel bridge with wheels at each end. The bridge travels along steel runways, which are supported by columns. A wheeled trolley with hoist mechanism travels transversely atop the bridge. The bridge is propelled along the runway by a motor drive, and a second motor within the trolley frame drives the trolley wheels. A third motor drives the hoisting mechanism. Electric current for the trolley motor is usually collected from copper wire strung along the inside faces of the bridge girders; current for the bridge-drive motor is collected from conductors along the runways. The crane can be controlled either from the floor by means of a hanging control pendant or from an overhead operator's cage. Traveling cranes are generally used in industrial and power plants and in outside stockpile areas. Bridge spans often reach 100 feet and lifting capacities 400 tons.

Fixed-Base Cranes

Fixed-base cranes are widely used in shipyards for fitting ships. One type, the tower cantilever, consists of double cantilevered arms supported by a structural-steel pillar. The pillar rotates inside a steel tower, swinging the arms with it. One or two load trolleys run on tracks along one arm, and a machinery house and counterweight are located on the opposite arm. An example of this type is the hammerhead crane at the League Island Navy Yard in Philadelphia. It is 245 feet high and has a lifting capacity of 392 tons. See Derrick. Edwin J. Knudsen

CRANE FLY, any one of several hundred species of flies belonging to the family *Tipulidae*, closely related to the mosquito and common housefly. Some species may reach a length of more than an inch. Crane flies are usually associated with dense vegetation and dampness. The body is mosquito-like and supported by six long, slender, weak legs. The wings, too, are fragile and weak, limiting flight to short distances at low speeds. The adults of some species feed upon flower nectar; none of them bites man. Metamorphosis is complete. The larvae of most species are aquatic; others are terrestrial but are limited to moist places. Some larvae are scavengers, and feed only upon plant food. Related families include *Trichoceridae*, or winter crane flies, and *Tanyderidae*, or primitive crane flies.

CRANIUM. See Skull.

CRANK, a U-shaped or L-shaped bend in a rotating shaft used for converting reciprocating, or back-and-forth, motion into rotary motion or the reverse. The crank is one of the most important inventions of mankind, ranking with the wheel as a basic factor in machine development. Its origin is unknown, but it was in use in Europe by about 850 for turning hand mills and grindstones. When windmills, water wheels, and treadmills were developed, cranks were employed to convert the rotary motion of these power sources into reciprocating motion that could be made to do such useful work as pumping water and sawing wood. Still later, cranks were used in steam engines and internal-combustion engines to convert the reciprocating motion of pistons into rotary motion. In these engines the combination of shaft and crank, or cranks, is called a crankshaft. See Internal-Combustion Engine; Steam Engine.

CRANMER, THOMAS, 1489–1556, English ecclesiastic and reformer, was born in Aslacton, Nottinghamshire. He attended Cambridge University and after his ordination in 1523 lectured there until 1529. As public examiner in theology at Cambridge, Cranmer stated that the marriage of Henry VIII to Catherine of Aragon was void because of her prior marriage to Prince Arthur, and that by submitting the question to disputation by university divines it could be decided without making an appeal to Rome. Henry ordered Cranmer to write a treatise in support of this opinion and sent him in 1530 to Rome and in 1532 to Charles V, the Holy Roman Emperor, to argue the case. While in Germany Cranmer married the niece of Osiander, the reformer, but he had by this time become so invaluable to Henry that the king appointed him Archbishop of Canterbury in 1533. He thereupon declared the marriage of Henry and Catherine null and void, opening the way for Henry to make Anne Boleyn his queen. As the king's confidante in matters of church and state, Cranmer strongly advocated breaking all ties with Rome, maintaining that the crown was supreme in ecclesiastical affairs, and officiated at several of Henry's weddings. He also succeeded in overcoming objections to the marriage of clergymen, and became a leader for moderate reform in the newly founded Anglican church.

After the death of Henry in 1547, Cranmer became one of the council chosen to govern during the minority of Edward VI. During this period the Reformation made rapid progress. Cranmer published his *Catechism, or Short Instruction into the Christian Religion* (1548), and *Defence of the True and Catholic Doctrine of the Sacrament* (1550), a powerful attack on the doctrine of transubstantiation. When the young sovereign died in 1553, Cranmer was persuaded to approve a royal will naming Lady Jane Grey as successor to the throne, although Henry VIII had specified Mary Tudor as being next in line. When Mary ascended the throne, Cranmer, deserted by the other supporters of Lady Jane, was found guilty of treason and stripped of his episcopal robes. The "reform" which Cranmer had so devoutly espoused—that a monarch had the right to determine the state religion and to impose it on every Englishman—now reacted in his disfavor since Mary was a Roman Catholic. Cranmer signed several recantations in which he admitted papal supremacy, but when brought to St. Mary's Church in order to recant in public, he astounded his audience by declaring that while the recantations were the work of his hand they were contrary to the truths he held in his heart; thus he set the stage for a final scene. As he was led to the stake to be burned as a heretic Cranmer thrust his right hand into the flames to be burned first, saying, "*This* hath offended. Oh, this unworthy hand." F. D.

CRANNOG. See Pile Dwelling.

CRANSTON, city, Rhode Island, Providence County, on the Providence and the Pawtuxet rivers, the New York, New Haven, and Hartford and the Warwick railroads, and U.S. Highway 1; 4 miles SW of Providence. Cranston manufactures include textiles, chemicals, metal products, machinery, plumbing supplies, plastics, and rubber, wood, and paper products. The State Hospital for Mental Diseases, a state infirmary, the state prison, two state reformatories, and two state training schools are at Cranston. In 1640 the area was settled as part of Providence; it was incorporated as a separate town in 1754. Pop. (1950) 55,060.

CRAPPIE, a fresh-water fish belonging to the family *Centrarchidae*, found from the St. Lawrence River and Lake of the Woods, Canada, south to Texas and west to the Dakotas and Kansas. The white crappie, *Pomoxis annularis*, is 7 to 10 inches long and colored a silvery olive mottled with dark green. It weighs about one pound. The white crappie has five or six spines on the dorsal fin. Another species, *P. nigro-maculatus*, is the black crappie. It is the same size but is somewhat darker in color than the white

crappie and can be distinguished readily by the seven or eight spines on the dorsal fin. Crappies feed on small fish, insects, insect larvae, and crustaceans. See CALICO BASS.

CRASHAW, RICHARD, 1613?–49, English poet of the metaphysical school, was born in London. The son of William Crashaw, a Puritan clergyman, he was educated at the Charterhouse and at Cambridge University. Despite his father's strong views on Puritanism, Crashaw was a devout Anglican, frequently visiting the religious retreat of Nicholas Ferrar at Little Gidding. Crashaw became a fellow of Peterhouse in 1637, but was expelled for his religious views when the Puritans took over Cambridge in 1643. In 1646 he went to Paris, where he was converted to Catholicism and introduced to Queen Henrietta Maria. Through her influence he met Cardinal Palotta in Rome and became his secretary. Later he became subcanon of the shrine at Loreto, Italy, but died soon after his appointment. Crashaw published a volume of sacred Latin poetry, *Epigrammatum sacrorum liber* (1634), in which appeared the famous line, "The modest water saw its God and blushed." His *Steps to the Temple* (1646) is a collection of religious poems, *Delights of the Muses* (1646) a secular verse, and *Carmen deo nostro* (1652) a collection of sacred poems.

CRASSUS, LUCIUS LICINIUS, 140–91 B.C., Roman orator and political leader. As consul with Quintus Mucius Scaevola, 95 B.C., his law banning from Rome all persons who were not citizens was a major cause of the Social War. As censor, 92 B.C., he closed the schools of the rhetors for their improper influence on students' minds. A patron of the arts and the outstanding orator of his time, Crassus was admired by Cicero, who introduced him as a speaker in *De Oratore* to represent Cicero's views on the subject of oratory.

CRASSUS, MARCUS LICINIUS, surnamed Dives, 115?–53 B.C., Roman financier and political leader. The son of Publius Licinius Crassus (Roman consul who committed suicide in 87 B.C. to avoid persecution by Gaius Marius), Crassus returned from exile in Spain in 83 B.C. to join Lucius Cornelius Sulla. Handsomely rewarded by Sulla for his part in overthrowing the Marians, Crassus received much confiscated property, gained further wealth by speculation, and was granted contracts for tax collection in the provinces. He became the richest man in Rome, thus justifying his surname "Dives" (the rich). As praetor in 71 B.C., he took command of the forces against Spartacus. Crushing the revolt after two commanders had failed, he became consul, with Pompey, in 70 B.C. Jealous of Pompey, Crassus enlisted Julius Caesar (who needed money) in a plot against Pompey, but neither had sufficient power to lessen Pompey's influence. Crassus became censor in 65 B.C. and renewed his alliance with Pompey. In 60 B.C. Caesar, Crassus, and Pompey formed the First Triumvirate which, financed by Crassus, gained control of the Roman government. With Caesar in Gaul, Crassus again shared the consulship with Pompey, 55 B.C.; in 54 B.C. he became proconsul of Syria. Seeking military glory, Crassus led a campaign against the Parthians that was at first successful, but his forces were annihilated at Carrhae (later Haran), 53 B.C. Crassus was murdered at a meeting with the Parthian commander.

CRATER. See VOLCANO, *Cones and Craters.*

CRATER, THE. See PETERSBURG CAMPAIGN.

CRATER LAKE NATIONAL PARK, in SW Oregon, in the Cascade Range, about 52 miles NNW of Klamath Falls, an area of 160,290 acres. The chief feature of the park is the lake in the crater of the extinct volcano, Mount Mazama. After the destruction of Mount Mazama in a violent eruption, volcanic activity in the crater created Wizard Island, a volcanic cinder cone. The lake, about 6 miles wide and 1996 feet deep, is the second deepest lake in North America. The deep blue waters are surrounded by multicolored lava walls, forested scenic slopes, and several peaks rising 9000 feet. The park, which was established in 1902, is open all year and is a winter sports area.

VAUGHN'S STUDIO

Cones of basaltic lava interest the tourist at Craters of the Moon National Monument. Centuries old, the cones were formed during three distinct periods of lava flow.

CRATERS OF THE MOON NATIONAL MONUMENT, in S central Idaho, about 135 miles ESE of Boise, an area of 48,003 acres. The area includes extraordinary varieties of volcanic activity—volcanic cones, craters, lava flows, caves, tunnels, and fissure eruptions. The national monument, established in 1924, derives its name from the fact that the general appearance of the area is suggestive of the surface of the moon as seen through a telescope.

CRATERUS, died 321 B.C., a Macedonian, one of the most trusted generals of Alexander the Great. After Alexander's death in 323 B.C., Craterus governed Greece and Macedonia jointly with Antipater, whom he aided in defeating the Greeks in the Lamian war. In the war between Antipater and Perdiccas, 321 B.C., Craterus died in battle against Eumenes, an ally of Perdiccas.

CRATES, of Athens, early fifth century B.C. Greek actor and poet who is regarded as the founder of Greek comedy. Only fragments of his writings exist, but Aristotle in his *Poëtica* credited Crates with establishing the comedy form in well developed plots. Aristophanes in *Knights* stated that Crates was the first to represent a drunkard on the stage.

CRATES, of Mallus, second century B.C. Greek grammarian, stoic philosopher, and critic, is known chiefly as the leader of the Pergamene school of criticism, as opposed to the Alexandrian school led by Aristarchus. Crates' major work was a critical analysis of the Homeric writings; he maintained that Homer's intent was to express scientific and philo-

Tourists marvel at Crater Lake's 1996-foot depth, apparent lack of a source or exit, and the story of its formation following a volcanic explosion thousands of years ago.

NATL. PARK SERVICE

sophical truths in the form of poetry. He visited Rome in the first part of the second century B.C., where he lectured on literary criticism and grammar. His visit was said by Suetonius to have led to the formal study of those subjects by the Romans.

CRATINUS, fifth century B.C. Athenian comic poet and satirist. Almost nothing is known of his life and only fragments of his writings have been preserved, but some biographical material and many of his plots appear in the writings of his contemporaries. Called the founder of the political lampoon, Cratinus used satire as a weapon and employed it vigorously (as in *Nemesis*) against most of the political leaders of the day, including the awesome Pericles. The *Panoptae* was a devastating satire on "know-it-all" philosophers and sophists; *The Wineflask*, produced in 423 B.C. was a retort to the taunts of Aristophanes, who claimed that Cratinus could not rouse himself from his drunken stupor long enough to write another creditable play. Nevertheless *The Wineflask*, in which Cratinus poked fun at his own weakness, won first prize in a competition, over Aristophanes' *Clouds*.

CRAWFORD, FRANCIS MARION, 1854–1909, U.S. novelist, son of sculptor Thomas Crawford, was born in Bagni di Lucca, Italy, and educated in the United States and in Europe. In 1879 he went to India where he studied Sanskrit and edited the *Indian Herald* at Allahabad. Returning to the United States in 1881, he contributed to various periodicals and continued the study of Sanskrit at Harvard University. In 1882 he wrote his first novel, *Mr. Isaacs*, story of a diamond merchant in India; it had an immediate success. After 1884 he lived in Sorrento, Italy, but often visited the United States and sailed his own yacht on frequent voyages. A prolific and highly successful writer, Crawford used romantic themes against exotic backgrounds that reflected his extensive travels; he believed that a novel should be a "pocket-stage," read solely for entertainment. But he also wrote such historical works as *Ave Roma Immortalis* (1898), *Rulers of the South* (1900), and *Gleanings from Venetian History* (1905). His *A Cigarette-Maker's Romance* (1890) was adapted for the stage, and his original drama *Francesca da Rimini* (1902) was produced in Paris by Sarah Bernhardt. In all Crawford wrote some 40 novels, including *Dr. Claudius* (1883), *An American Politician* (1884), *Zoroaster* (1885), *A Tale of a Lonely Parish* (1886), *Saracinesca* (1887), *Via Crucis* (1898), *Marietta* (1901), *The Heart of Rome* (1903), *Soradella* (1909), and *Wandering Ghosts* (1911).

CRAWFORD, ISABELLA VALANCY, 1850–87, Canadian poet, was born in Dublin, Ireland, but in 1858 emigrated with her parents to the Kawartha Lakes region of Ontario, where her father practiced medicine. After his death she moved to Toronto where she contributed poetry and short stories to newspapers, using the remote scenes of her childhood as a background. Her pleasant and lyrical poems attracted little attention until the publication of *Collected Poems* (1905). She also wrote *Old Spookses' Pass, Malcolm's Katie, and Other Poems* (1884). She died in poverty.

CRAWFORD, JOAN, real name Lucille le Seuer, 1908– , film actress, born in San Antonio, Tex. As Lucille le Seuer she danced in such Broadway musical revues as Shubert's *Passing Show*. Among her most notable films were *Dancing Daughters* (1928), *Rain* (1930), and *A Woman's Face* (1941). In 1946 she won the Academy Award for her performance in *Mildred Pierce*. Among her later pictures were *Possessed* (1947), *Flamingo Road* (1949), *Goodbye My Fancy* (1951), and *Autumn Leaves* (1956).

CRAWFORD, THOMAS, 1813?–57, U.S. sculptor, was born in New York City, but after 1834 lived in Rome, Italy. His first important work was a group, *Orpheus* (1839) for the Boston Athenaeum, followed by *Dancing Girl* (1844), *Dying Indian Maiden* (1848), and *Flora* (1853), all acquired by the Metropolitan Museum of Art, New York. In 1849 Crawford was commissioned to design the equestrian statue of George Washington at Richmond, Va. He is best known for his armed figure of Liberty on the Capitol dome in Washington, D.C.

CRAWFORD, WILLIAM HARRIS, 1772–1834, U.S. lawyer and political leader, was born in Amherst County, Va. He was admitted to the Georgia bar in 1798, and was a member of the state legislature, 1803–06. In 1807 Crawford was chosen to fill a vacancy in the U.S. Senate, but not before he had killed one man in a duel and been wounded himself in another. Elected president *pro tempore* of the Senate in 1812, he at first opposed, but eventually supported, the war with England. Appointed U.S. minister to France, 1813, he was a popular figure in Paris and became a friend of the Marquis de Lafayette. Crawford was secretary of war, 1815–16, and secretary of the treasury, 1816–25. In the congressional caucus which nominated James Monroe for the presidency in 1816, Crawford narrowly lost the nomination. Thinking that he was entitled to the nomination in 1824, he insisted upon calling a caucus, a procedure then virtually extinct. Crawford was nominated but during the campaign suffered a paralytic stroke from which he never fully recovered. None of the candidates—Crawford, John Quincy Adams, Henry Clay, and Andrew Jackson—received a majority of the electoral vote, but Adams was elected by the House of Representatives. After 1827 Crawford was judge of the northern circuit of Georgia.

CRAWFORD NOTCH, picturesque pass in the White Mountains, N central New Hampshire, on the Appalachian Trail and U.S. Highway 302; about 8 miles SW of Mount Washington. Crawford Notch divides the White Mountains (see WHITE MOUNTAINS) into the Presidential Range on the east and the Franconia Mountains on the west. The Saco River flows through the notch about 2000 feet below the crests of the mountains. The area forms Crawford Notch State Park.

CRAWFORDSVILLE, city, W central Indiana, county seat of Montgomery County, on Sugar Creek, the Monon, the New York Central, and the Pennsylvania railroads, and U.S. highways 136 and 231; 48 miles NW of Indianapolis. Crawfordsville, which is the commercial center of a rich agricultural area, has printing industries and manufactures wire and nail products and clothing. It is the seat of Wabash College for men. The city was settled in 1822. There is a memorial to Lew Wallace, author of *Ben Hur*, who lived there. Pop. (1950) 12,851.

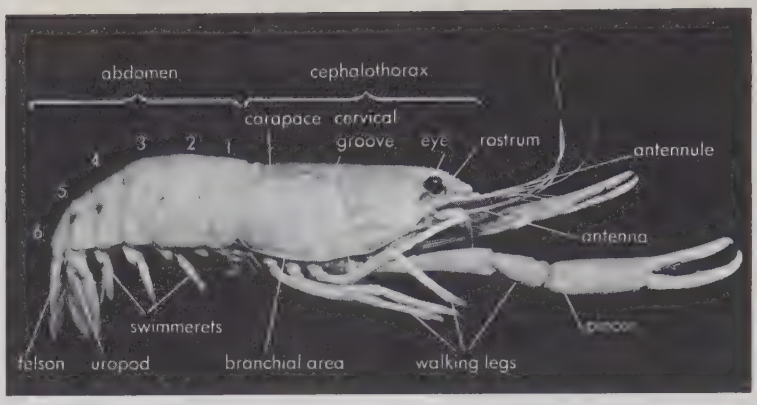
CRAYER, CASPAR DE, 1584?–1669, Flemish painter born in Antwerp. He was a contemporary of Van Dyck and Rubens whose portraits he painted. Crayer was much influenced by Rubens and rivaled him in the quantity of his productions, if not in quality. Almost every church and chapel in Flanders possesses examples of Crayer's art. A skilled decorative artist, he was appointed court painter by Cardinal Ferdinand, later Holy Roman Emperor. Though Crayer lived in Brabant most of his life, he spent his last years in Ghent. Among his best works are *The Judgment of Solomon* and *Madonna with Saints*.

CRAYFISH, also called crawfish, is a lobster-like crustacean that is noted for its ability to regenerate injured appendages and eyes (see CRUSTACEA; LOBSTER). About 85 species of crayfish, genera *Cambarus* and *Astacus*, live in the ponds, rivers, streams, and lakes of North America, western Asia, and Europe. Fossil species are known from the Mesozoic era. See GEOLOGIC TIME.

Crayfish burrow into the sand or mud, or hollow out a shelter under stones. Predatory by nature, the crayfish hides at night at the entrance of its burrow or behind other cover, awaiting its prey. The unwary victim is seized by the powerful pincers of the crayfish, torn to pieces, and immediately eaten. When living animals are unavailable the crayfish will feed upon decaying animal matter and aquatic plants. The crayfish avoids its enemies by protective colora-

tion that allows it to blend into the background, and also by propelling itself rapidly backward.

External Structure. The body of the crayfish is covered by a hard exoskeleton composed of chitin and other material (see CHITIN). The exoskeleton is rigid, bending only at the joints. There are 18 segments, or somites, between the mouth and posterior tip, called the telson. The first four segments are fused to form the head, the next eight form the thorax, and the remaining six segments and the telson comprise the abdomen. The head and thorax together are called the cephalothorax. Each abdominal segment consists of several parts—a curved dorsal plate, or tergum; a narrow bar, or sternum, across the ventral surface; and a small plate, or pleuron, on each side. The sterna are connected by a thin membrane. In front of the crayfish's head and not considered as a body segment is a pair of jointed filaments called antennules which function in taste, touch, and equilibrium.



External Structure of Crayfish

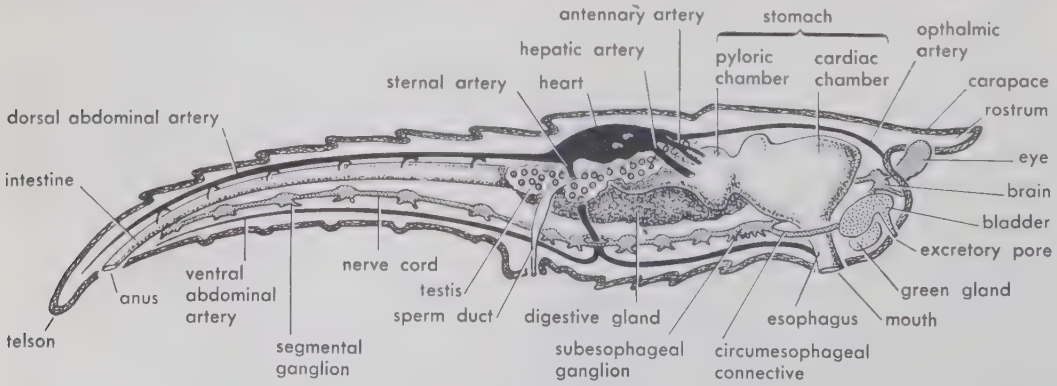
Each somite bears a pair of jointed appendages. The first true body appendages are the long antennae that are also mobile sensory structures. The next appendages, in order, are the mandibles, or jaws; the first maxillae, which direct food to the mouth; and the second maxillae, which act to circulate water through the gill cavity. The thoracic appendages include the first, second, and third maxillipeds, all of which serve to break up food and pass it to the mouth. The second and third maxillipeds bear gills. The crayfish has five pairs of walking legs, the first four pairs of which have gills and the first two pairs of which also have pincers that are used for both offensive and defensive grasping. Gills are absent from the fifth pair of walking legs.

Females bear an external sex pore at the base of the third pair of walking legs while the males bear their external sex pore at the base of the fifth pair of walking legs. The first five somites of the abdomen are the swimmerets, and the sixth is the uropod. The first two pairs of male swimmerets are modified for transferring sperm cells, but those of the female are nearly functionless. The third, fourth, and fifth pairs of swimmerets direct a current of water toward the gills and in the female carry the eggs. The uropod is used in swimming backward and with the telson forms the crayfish's tail.

Internal Structure. Several representative systems occur in the crayfish. The digestive system begins as food is pulled apart by the maxillipeds, and placed in the mouth from which it travels through the short esophagus to the stomach. The anterior chamber of the stomach contains a cardiac portion and a gizzard, which is lined with chitinous teeth that grind and pulverize the food. The food then passes into the digestive glands which secrete the enzymes necessary for digestion, and thence through the anterior, or pyloric, chamber of the stomach into the intestine, where absorption takes place. Waste matter is finally discharged through the anus. Nitrogenous wastes and excess water are extracted from the blood by the green glands and discharged through specialized excretory pores.

The crayfish breathes by means of a number of paired gills, some of which are attached to the sides of the thorax, others to the basal parts of the maxillipeds and walking legs, and still others to the membranes between the legs. Water, directed toward the gills by movement of the second pair of maxillae and the third, fourth, and fifth pairs of swimmerets, enters the gill chamber under the free edges of the carapace. When the water passes over the gills, an exchange of carbon dioxide and oxygen is made between the capillaries of the gills and the surrounding water.

The circulatory system of the crayfish is called an open system because the blood is not limited to vessels as it flows through the body. The system includes a heart, arteries, and a number of cavities, or sinuses, within the tissues. When the muscles of the heart are relaxed, aerated blood from the surrounding pericardial sinus enters the heart through three pairs of valvular openings called ostia. Upon contraction of the muscles of the heart, the blood is forced into the arteries from which it is distributed to all parts of the body. Blood returns from the tissues by means of sinuses and collects in the large sternal sinus, which sends it to the gills where the gaseous exchange takes place. The freshly aerated blood then returns to the



Internal Structure of Crayfish

pericardial sinus through a number of channels. The blood of the crayfish is composed of a nearly colorless plasma containing suspended white, ameboid blood cells and a dissolved oxygen-absorbing substance called hemocyanin.

The main elements of the central nervous system are the brain and two circumesophageal connectives that join to form the ventral nerve cord. The brain, which is composed of fused ganglia of the first three segments, gives off nerves to the eyes, antennules, and antennae. Located beneath the esophagus is the subesophageal ganglion which sends nerves to the mouth parts, maxillipeds, green glands, esophagus, and thoracic muscles. Connecting the brain and subesophageal ganglion and passing on each side of the esophagus are the circumesophageal connectives. The nerve cord contains a number of ganglia, located at the different segments, which send nerves to the muscles and appendages of the remaining segments. The sense organs include one pair of compound eyes, each of which contains about 2500 individual eyes. Organs of equilibrium are contained in the antennules. Touch and taste bristles are borne on the appendages and other parts of the body.

The sexes are separate in the crayfish, with the female having a broader abdomen than the male. In the female there are paired ovaries and oviducts leading to the external openings. In the male there are paired testes and paired vas deferens, or sperm ducts. The mating season varies with species and climate, but is usually in the spring or fall. During copulation the male places its sperm cells in the seminal receptacle of the female. The sperm cells may be carried for some time before the eggs are laid. From 200 to 400 eggs, each about 2 mm in diameter, are laid and immediately fertilized. The fertilized eggs are fastened to the abdomen of the female by a sticky secretion and are carried about in this manner until the young crayfish are hatched, within two to five weeks in most species. Several days after hatching the young undergo their first molt. During the first two months of life the young crayfish may molt six or more times and attain a length of 35 to 50 mm. After the first two months the young crayfish molts two or three times a year, adults less often.

CRAZY HORSE, 1849?–77, Oglala Sioux chief. He was a young warrior in the Red Cloud War, 1866–67. Later he led a band allied with Sitting Bull's Hunkpapas in an uprising against reservation life. In 1876 he was principal leader of the Oglalas in the Battle of the Rosebud against Gen. George Crook's forces, and in the Battle of the Little Big Horn where Gen. George A. Custer's force was annihilated. Crazy Horse surrendered in 1877 and was bayoneted to death in an attempt to force him to enter the guardhouse at Fort Robinson, Neb. DON RUSSELL

CREAM. See MILK.

CREAM OF TARTAR, or potassium acid tartrate, is obtained from grape juice, from which it is deposited during fermentation in a crude form called argol. It is purified by filtration of its solution through animal charcoal, followed by crystallization. Cream of tartar is a white crystalline solid, with a pleasant, slightly acid taste. The compound has the formula $KHC_4H_4O_6$. It is commonly used as an ingredient in baking powders, where it inhibits the formation of carbon dioxide until the optimum baking temperature is reached (see BAKING POWDER). Cream of tartar is frequently the major ingredient in brass and chrome cleaners. It is also used in dyeing to fix colors, in medicine as a purgative, and in the manufacture of candies. See TARTARIC ACID.

CREAM SEPARATOR. See DAIRY INDUSTRY; CENTRIFUGE.

CREASY, SIR EDWARD SHEPHERD, 1812–78, English historian, was born at Bexley, Kent. Professor of history in London University after 1840, he became chief justice of Ceylon in 1860. Creasy is best remembered for his *Fifteen Decisive Battles of the World* (1852), the work which is usually called "Creasy's Battles."

CREATINE and **CREATININE.** See METABOLISM, *Peculiarities of Tissue or Organ Metabolism;* MUSCLE, *Chemical Aspects of Muscular Contraction.*

CREATION, in the Christian and Jewish faiths the series of acts by which God brought into existence heaven and earth, day and night, growing plants, living creatures, and finally man. This biblical story of creation is told in Genesis. Actually, there are two stories, differing in the account and the order of the creative acts. The first account (1: 2-4a) follows the succession of seven days—six days for the eight creative acts of God's work and the seventh day (or sabbath) for divine rest. Each act of creation is done by divine fiat with a refrain repeated eight times with the form of verse 3: "And God said, Let there be light: and there was light." Each day of creative work closes with the refrain of verse 5: "And the evening and the morning were the first day." A third refrain repeated six times signifies divine approval of His work: "And God saw that it was good."

The second story of (2: 4b–25) opens with a brief reference to the creation of the earth and the heavens. Its purpose appears to be supplementary to the first account, with the emphasis here placed on man as the central figure of God's creation. Man is formed out of the dust of the ground, and he is made at the beginning of the creative process. Adam is put into the garden of Eden to dress it and to keep it. Other living creatures are likewise formed out of the ground. Finally, out of one of Adam's ribs the Lord God makes woman to be a helpmeet for him.

Some scholars believe that these two accounts are taken from different sources incorporated into the Book of Genesis. The first story is said to be from the source called "P" (Priestly Code), which was probably compiled in the fifth century B.C. The second story is from "J" (Jehovistic or Yahwistic strand), which was probably written about 850 B.C. The first account, these scholars point out, has an elevated conception of God while the second has a rather primitive conception of the Lord God. The first is a comprehensive and orderly account of creation while the second is brief and incomplete.

The Genesis accounts of creation are based on the spiritual concepts of ancient Judaism and on the cosmogony of that age. In the opening words of Genesis: "In the beginning God . . ." is expressed the Hebrew faith in God in the foundation of all things.

Creation stories are found in the early literature of many peoples. Since the idea of creation is associated with speculation on the nature of the Creator, the form and content of each account is influenced greatly by religious concepts. Many of the various creation stories have points of similarity. The biblical story has striking similarities to the Babylonian creation account. There are coincidences in general outline and in detail, yet there are wide differences between the polytheistic concepts and fantastic imagery of the Babylonian story and the sober dignity and lofty monotheism of the Hebrew account. The likenesses may be ascribed to the general indebtedness of Israel to Babylonian civilization, while the differences may be attributed to the religious development of the Hebrew nation. See ADAM AND EVE; BIBLE; GENESIS.

CRÉBILLON, CLAUDE PROSPER JOLYOT DE, 1707–77, French writer, son of the dramatist Prosper Crébillon, was born in Paris. He was the author of a number of clever satires and witty, but cynical (and sometimes bawdy), tales which were widely read in France and were also popular in English translation. *L'Écumoire, ou Tanzaï et Néadarné, historie japonaise* (1734), a thinly veiled attack on Cardinal de Rohan and the Duchesse du Maine, led to Crébillon's imprisonment and a subsequent five-year exile. He later became a favorite of Madame de Pompadour and, ironically, was appointed censor of literature. His best known works were *Les amours de*

Zéokinizul, roi des Kofirans (1740), in which "Zéokinizul" is easily recognized as Louis XIV; and *Le sopha, conte moral* (1745), a tale moral in name only. It has been said that Crébillon's writings would have been the most immoral ever produced in France had not the Marquis de Sade come along later.

CRÉBILLON, PROSPER JOLYOT DE, 1674–1762, French dramatist, was born in Dijon and studied law at the Collège Mazarin. He was encouraged to write by his employer, an advocate named Prieur, and when *Idoménée* (1705), Crébillon's poetic tragedy, was favorably received by critics the young author gave up the practice of law and devoted himself to the theater. *Atrée et Thyeste* followed in 1707, and *Electre* in 1709; both were successful, but *Rhadamiste et Zénobie* (1711) established him as the most successful playwright of the day and brought him fame, if not fortune. The plot of *Rhadamiste* is so full of complicated situations as to be almost incomprehensible, but it was a court favorite for years. Crébillon's next plays, *Xerxès* (1714) and *Sémiramis* (1717), also tragedies on classical themes, were almost complete failures. After *Pyrrhus* (1726), which met with a moderate success, Crébillon went into a 22-year retirement. In 1745 Madame de Pompadour prevailed upon the aged poet to write a new drama, *Catalina*, for the court and set him up as a rival to Voltaire. Voltaire responded by taking as subjects for five tragedies of his own the themes of five of Crébillon's plays. Although Crébillon followed in the tradition of Racine and Corneille, his work never reached the artistic heights of his predecessors; the tragic grandeur of the earlier classicists in his hands become melodrama, and with the inevitable imitators of his style came a decline in French classical tragedy.

CRÉCY or **CRESSY,** also Crécy-en-Ponthieu, village, N France, in the department of Somme, 12 miles N of Abbeville. Crécy is a minor agricultural market and processing center. It was the scene, in 1346, of the victory of King Edward III of England over Philip VI of France (see HUNDRED YEARS' WAR). Although outnumbered, the English inflicted a crushing defeat on the French army. The battle is of significance in military history because it demonstrated for the first time on the continent the superiority of the English longbow over the crossbow and heavy armor of the French knights. Edward the Black Prince led one of the divisions of the English army. Pop. (1954) 1360.

CREDIT, the trust given to a purchaser for his promise to pay for goods, services, a loan or pecuniary right advanced to him. Because so many business transactions are conducted either by deferring payment or by borrowing from a third person to pay immediately in cash, credit plays an indispensable role in modern economic life. Most of the "money" that is used in daily life is actually credit. Money itself is defined in terms of debt—United States Treasury silver certificates carry the legend, "This certificate is legal tender for all debts, public and private." By far the greatest proportion of money in the United States consists of bank credit in the form of Federal Reserve Bank notes and checks written on commercial banks. See MONEY.

Bases of Credit. A common meaning of the word credit is trust or belief; the essential basis for extending credit is the belief that the debtor will pay his obligation according to agreement. Therefore, trust in the honesty and integrity of the borrowing individual or firm is paramount. The creditor also must know whether the borrower will be able to pay at the agreed time. Commonly, the creditor, in order to insure that he will receive his money, will ask for security, such as a pledge of property, capital assets, farm crops, real estate, or a guarantee by a third party that the claim will be paid. Because the lender very often does not have personal knowledge of the borrower's trustworthiness and ability to pay, specialized firms gather this information about individuals and businesses. The credit information service gives each borrower a credit rating and the confidential information is sold to lenders who seek it.

Types of Credit. Credit takes many forms, is used for a wide variety of purposes, and is extended by many different kinds of agencies. Most persons, banks, business firms, and governments engage in both borrowing and lending. An individual lends money when he deposits money at his bank or savings institution, buys a government security, or invests in a corporate bond. He borrows when he uses a retail store charge account, secures a loan from a finance company or bank, or mortgages his home. See CONSUMER CREDIT.

Business firms usually depend on borrowed money to carry on business and expand facilities. Manufacturing, wholesaling and retailing firms extend credit to each other in their dealings. For working capital, firms borrow from banks or issue promissory notes through specialized firms dealing in commercial paper, most of which is in turn purchased by banks. Longer-term loans for investment capital take the form of bond issues, usually in denominations of $1000 or more. See BOND; FINANCE.

Local, state and national governments are heavy borrowers. Their debt obligations may take the form

TOTAL CREDIT IN THE UNITED STATES, 1940–1954

(as shown by net public and private debt in billions of dollars)

Year	Public and Private	Public			Private					
		Total	Federal[1]	State and Local[2]	Total	Long-term				Short-term
						Total	Corporate	Farm Mortgage	Non-farm Mortgage[3]	
1940	189.9	61.3	44.8	16.5	128.6	76.2	43.7	6.5	26.0	52.4
1941	211.6	72.6	56.3	16.3	139.0	77.2	43.6	6.4	27.2	61.9
1942	259.0	117.5	101.7	15.8	141.5	75.5	42.7	6.0	26.8	66.1
1943	313.6	169.3	154.4	14.9	144.3	72.6	41.0	5.4	26.2	71.7
1944	370.8	226.0	211.9	14.1	144.8	70.8	39.8	4.9	26.1	74.0
1945	406.3	266.4	252.7	13.7	139.9	70.1	38.3	4.8	27.0	69.9
1946	397.4	243.3	229.7	13.6	154.1	78.6	41.3	4.9	32.4	75.5
1947	417.9	237.7	223.3	14.4	180.2	89.9	46.1	5.1	38.7	90.3
1948	434.0	232.7	216.5	16.2	201.3	102.9	52.5	5.3	45.1	98.4
1949	448.1	236.7	218.6	18.1	211.4	112.7	56.5	5.6	50.6	98.7
1950	490.7	239.4	218.7	20.7	251.3	125.5	60.1	6.1	59.3	125.6
1951	524.6	241.8	218.5	23.3	282.8	140.6	66.6	6.6	67.4	142.3
1952	555.4	248.7	222.9	25.8	306.7	155.6	73.3	7.2	75.1	151.2
1953	584.7	256.7	228.1	28.6	328.0	170.1	78.8	7.7	83.6	157.9
1954	605.5	263.6	230.2	33.4	341.9	186.4	83.7	8.2	94.5	155.5

[1]Includes categories of debt not subject to statutory debt limit
[2]Figures are for June 30 of each year
[3]Data are for noncorporate borrowers only

SOURCE: *The Conference Board; Department of Commerce*

of short-term bills, intermediate-term notes, or long-term bonds. Some governments have even issued stock, as in the case of the British Consols (see CONSOLS). The United States government borrows money with notes ranging from 91-day Treasury bills to 40-year bonds. States, municipalities, counties, school districts, highway authorities and other local units borrow by issuing bonds to finance the building of many kinds of public facilities.

The United States government lends large amounts of money within the country and to foreign governments. It lends money directly to local governments, firms, and individuals through its own lending institutions; guarantees loans made for specific purposes by commercial banks; and supports the lending activities of quasi-governmental banks for certain purposes. Since World War II, the federal government has made large loans to foreign governments to bolster their economies or to raise their productive output.

Bank Credit. Most credit is supplied by banks which "create" money in their lending operations. Because the profitability of a bank depends upon the interest that it charges on loans, a bank is encouraged to lend as much money as possible consistent with security and government regulations. The most important kind of bank credit is the check. In making a demand deposit a depositor places his money holdings into a bank (the bank being the debtor and the depositor the creditor), and is permitted to write checks up to the amount of the deposit. If the bank uses part of this money to make a loan to a business firm or individual, the extension of this credit creates money. In making the loan the bank usually permits the borrower to write checks up to the value of the loan. Commercial banks and more specialized financial institutions, such as mutual savings banks and savings and loan associations, also supply credit in other ways by investing in commercial paper, bonds, mortgages, and government securities.

Credit Control. Before World War I, most national governments and banking authorities placed their faith in the gold standard as an automatic regulator of the volume of money and credit. (See GOLD STANDARD.) The gold standard was generally abandoned after World War I, and the intentional management of the quantity of money and credit became a standard practice. However, the Bank of England, despite its own denials, had practiced some credit management since 1837. With the creation of the Federal Reserve System in 1913, the machinery for controlling credit in the United States was vastly improved. Member banks of the Federal Reserve System are required to keep a certain fraction of their deposit liabilities as a reserve fund at a Federal Reserve bank. Each bank can expand its loans only up to a certain multiple of reserves. Total reserves and the reserve requirements are controlled by the Federal Reserve Board. (See BANKS AND BANKING, Federal Reserve System.) Open market operations, which determine the availability of reserves, have been controlled by the Open Market Committee of the board since 1923. By using these powers, the Federal Reserve Board can control the total volume of credit in the United States. According to the British economist John Maynard Keynes, such a central bank "is master of the situation and is in a position to control not merely the volume of credit but the rate of investment, the level of prices and in the long run the level of incomes . . ." In addition, the Federal Reserve Board was empowered to control the volume of consumer credit during World War II and the Korean War.

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CREDIT INSURANCE. See CASUALTY INSURANCE.

CRÉDIT MOBILIER OF AMERICA, a company which was engaged in the construction of the Union Pacific Railroad, and which gave rise to a major political scandal. A few Union Pacific stockholders and directors, led by Oakes Ames and Thomas C. Durant, acquired control of an inactive Pennsylvania corporation, renamed it the Crédit Mobilier of America after a French financial company, and in 1867 secured contracts for Union Pacific construction at costs which meant great profits for the newly-formed organization. These gains for the small group of Crédit Mobilier stockholders were at the expense of the shareholders in the Union Pacific and indirectly of the United States government, which had made large grants of land to aid in construction of the railroad. Ames, a representative in Congress as well as a leading figure in the Union Pacific and Crédit Mobilier, wanted to forestall congressional inquiries. He therefore distributed Crédit Mobilier shares to some influential senators and representatives at par, though the value was much higher, and in some cases with payments postponed until they could be made out of accumulated dividends. The arrangements, disclosed in part by the *New York Sun* during the presidential campaign of 1872, were investigated by both houses of Congress. Ames and Representative James Brooks of New York were formally censured by the House. Others accused of involvement included Vice-President Schuyler Colfax, James A. Garfield, then a representative from Ohio, and Senator James W. Patterson of New Hampshire. See AMES, OAKES; UNION PACIFIC RAILROAD.

CREDIT UNION, a co-operative association to pool savings and supply small loans to members. Its chief purpose is to enable persons of moderate means to borrow at low rates of interest. Like other groups organized on a co-operative basis (see CO-OPERATIVE), the credit union is owned and operated by its patrons, who purchase shares in the enterprise. Each member is limited to one vote.

History. Because of the usurious rates often charged for small loans among the poor, the provision of cheap credit has been a social problem in many countries for centuries. Mutual aid to provide loans for families in distress was practiced in many countries in the past, and credit co-operation continues to be one of the most rapidly spreading forms of co-operation among the low economic groups of many countries. Modern credit unions are an outgrowth of the credit co-operation movement in Germany after 1860 under the leadership of Herman Schulze-Delitzsch and F. W. Raiffeisen. The movements begun by these men developed separately, the Schulze-Delitzsch associations having mostly urban members and the Raiffeisen groups being organized among small farmers. Credit co-operation also developed late in the nineteenth century in France, Italy, Rumania, India, and Japan.

The first credit union in North America was formed at Lévis, Canada, by Alphonse Desjardins in 1900. The movement spread to the United States in 1909 when a credit union was organized by Desjardins among French Canadians in Manchester, N.H. Massachusetts passed the first credit union law in 1909 at the instigation of Pierre Jay, the state bank commissioner, and Edward A. Filene, a prominent Boston merchant. Other states passed similar laws in later years, but the credit union movement lagged until 1921 when Filene organized the Credit Union Extension Bureau under the direction of Roy F. Bergengren. In 1934 Congress passed the Federal Credit Union Act, permitting unsecured loans up to $50. This limit was later gradually increased to $400 in 1949. By 1955 practically every state in the United States and every Canadian province had passed credit union laws. The Credit Union National Association was formed in 1934 as a national body for credit unions in the United States; in 1939 Canadian credit unions were permitted to join. It provided loan protection and savings insurance to credit union members. In 1952 CUNA began an educational program to promote the spread of credit unions.

Recent Growth. There were only 199 credit unions in the United States in 1921. The number of unions and membership grew rapidly during the 1930s, but the greatest expansion occurred after World War II. In 1955 there were more than 16,000 credit unions, with a total membership of about 7.9 million and total assets of more than $2.7 billion. Most of these were organized among persons having some common tie; such as church, labor union membership, employment in the same company, or similar association. See CONSUMER CREDIT.

NATL. FILM BOARD

A Cree woman shown with her children in Manitoba, where the tribe lives on several reservations. Formerly Cree Indians roamed from Hudson Bay westward to Lake Winnipeg.

CREE, a tribe of Indians who still inhabit the lands in Manitoba on which they lived at the time of the first white contact. Their warlike activities were confined to rival tribes whom they drove away or brought under control. With the French and the English they always remained at peace, to the great profit of the Indians themselves and the Hudson's Bay Company traders. The Cree had a wide reputation as sharp traders. They live in scattered bands in Manitoba reservations and number about 15,000. They speak an Algonquian dialect closely related to that of the Chippewa. R. C. DOWNES

CREED, an affirmation of the basic doctrines of religious faith. A creed differs from a confession of faith in that the former is a brief affirmation used liturgically while the latter is a fuller statement of theological doctrines. In Christianity the great affirmation of faith is the Apostles' Creed, which is a summary of the doctrines attributed to the apostles. The Nicene Creed and the Athanasian Creed are elaborations of the same general doctrines with changes in emphasis. These three are called the ecumenical creeds because of their general acceptance throughout Christendom. For occasional liturgical use some Protestant groups have developed new creeds or affirmations of faith with modern changes in emphasis.

The Apostles' Creed was formerly based on the tradition that each of the 12 apostles contributed to it. The only trace of a creed in the New Testament is the simple confession that Jesus is the Lord and the Son of God (Rom. 10: 9; Acts 8: 37). The creed grew by accretion and selection. By A.D. 150 the following form was probably used in some churches: "I believe in God the Father almighty and in Christ His only Son our Lord and in the Holy Ghost, the holy church, the remission of sins and the resurrection of the flesh." The present form probably appeared about 750, perhaps in Burgundy; it gradually replaced all other forms, partly because Charlemagne insisted on liturgical uniformity. Some of the Protestant groups have made slight changes in the traditional form.

The Nicene Creed is traditionally attributed to the Council at Nicaea (325). The present form, however, first appeared at the Council of Chalcedon (451), where it was ascribed to the Council of Constantinople (381). It is believed that the accepted form closely resembled the baptismal creed that Cyril of Jerusalem (315?–386) had used. This creed replaced the true Nicene Creed; it was adopted in the East as the baptismal creed and later was accepted in the West for liturgical use. In later centuries the *filioque* clause was added in the West to affirm that the Holy Ghost proceeds from the Son and from the Father. The East refused to accept this addition, and the resulting controversy was one of the reasons for the division between the Roman Catholic and Eastern Orthodox churches.

The Athanasian Creed, sometimes called *Quicunque Vult* (whoever wishes), was long believed to be the work of Athanasius (293?–372). It is now believed by many scholars that this creed was written not earlier than the fifth century. It is a theological exposition of the doctrines of the Trinity and the Incarnation, emphasizing the three persons in the one divine nature of God and the two natures (divine and human) in Christ. The Athanasian Creed is one of the symbols of the faith approved by the Western church and given a place in her liturgy. See CONFESSION OF FAITH.

CREEDE, town, S central Colorado, county seat of Mineral County, in the San Juan Mountains, on the upper Rio Grande River; 69 miles NE of Durango. Silver was discovered here in the early 1890s, and Creede was the leading silver producer in the state for a number of years. Pop. (1950) 503.

CREEK, one of the largest divisions of the Muskhogean family of Indians, named for the numerous streams in their country. Their early habitat was the greater portion of Alabama and Georgia on the Coosa and Tallapoosa rivers. They were once a powerful southern tribe, known as Northern or Upper, and Southern or Lower Creeks. The Upper Creeks, incited by a visit from Tecumseh in 1811, and encouraged by the Spanish at Pensacola and by British interests, began the Creek War of 1813–14 with a massacre at Fort Mims in August 1813 (see MIMS, FORT). Troops were raised in Georgia, Mississippi Territory, and Tennessee, and Maj. Gen. Andrew Jackson led Tennessee volunteers in a series of campaigns culminating in his victory on March 27, 1814, at Horseshoe Bend of the Tallapoosa River, where an estimated 900 hostile warriors were killed. The Treaty of Fort Jackson, August 1814, ended the war, the Creeks giving up parts of Georgia and Alabama. The Upper Creeks, having more contact with the white man, were more progressive and influential than the lower or fullblood faction and were leaders in negotiating early treaties looking to their emigration to the West, which occurred principally between 1830 and 1840. Generally the Upper Creeks sided with the Confederacy during the Civil War, while the Lower Creeks

N.Y. PUBLIC LIB.

Creek Indian Chief

suffered much because of their loyalty to the Union. In 1901 the Creeks signed a treaty with the Dawes Commission agreeing to the distribution of their lands to 18,761 members, including 6809 Negroes. The Creeks now live in Oklahoma. See MUSKHOGEAN.

GRANT FOREMAN

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CREEK, in physical geography, a fresh-water stream smaller than a river but larger than a brook. In North America and Australia small rivers are frequently called creeks. Creek sometimes refers to a salt water inlet, an estuary, or an embayment of a large body of water.

CREEP, gradual permanent deformation of a solid material subjected to constant stress. It occurs slowly and at stresses below the elastic limit of the material (see ELASTIC LIMIT). Thus, it is not the same as stretching, bending, or compression. Instead, the material flows somewhat like an extremely thick liquid. Creep is especially important in metals, although it also occurs in concrete and other materials. Soft metals such as tin, lead, and zinc creep at ordinary room temperatures; harder metals do not creep appreciably except at higher temperatures. The phenomenon has become increasingly important because operating temperatures in modern machines generally have increased while running tolerances have decreased. Gas-turbine engines, for example, contain close-fitting parts subjected to high temperature by burning fuel and to high stress by their great rotational speed. Creep in these parts is disastrous because it causes them to strike adjacent parts. Aircraft structural parts creep when heated by friction with the air at high speeds. This heating has imposed a so-called "heat barrier" on speeds, but scientists and engineers have helped push back the barrier by developing new materials that resist creep (see AERODYNAMICS, Problems of High-Speed Flight, *Aerodynamic Heating*). Creep also poses problems in high-pressure steam boilers, steam turbines, and petroleum refining equipment.

Creep characteristics of a metal are usually determined by subjecting a test specimen to a load while enclosed in a furnace that keeps it at a constant temperature. Stretching is plotted on a graph as a function of time. The graph shows how the specimen behaved during the test and how it is likely to behave over a longer period, enabling engineers to use the metal without risking excessive creep.

CREEPER, a family of perching birds that is characterized by weak flight and a continuous creeping up and around the trunks of trees and over rocks in search of insects and their eggs. There are about 15 species of creepers, family *Certhiidae*, ranging throughout the Northern Hemisphere. The only North American species, the brown creeper, *Certhia familiaris*, has a long, slender, curved bill. Its plumage is usually a soft inconspicuous brown, its tail short and square. The toes are very long and sharp. These birds' nests, of bark, wool, moss, or twigs, are placed in holes in trees. Five to eight eggs with reddish brown spots are laid in late spring. The largest creeper, *Tichodroma muraria*, about 7 inches in length, is found in the mountainous regions of Europe and Asia. It is a dull gray bird with a black chest and throat, and red patches that are evident on the wing during flight.

Brown Creeper

CREEPER. See CLIMBING PLANT.

CREFELD. See KREFELD.

CREIGHTON UNIVERSITY, of Omaha, Neb. is an accredited coeducational institution maintained by the Jesuit order. It was founded in 1878 through a bequest made by Mary Lucretia Creighton, of Omaha, in memory of her husband. Its instructional divisions include the college of arts and sciences, schools of medicine, dentistry, law, and nursing, and a graduate school. See COLLEGES AND UNIVERSITIES.

CREMA, town, N central Italy, in the region of Lombardy and the province of Cremona, on the Serio River, about 27 miles ESE of Milan. Crema is a commercial center that manufactures textiles, agricultural machinery, and iron products. The town has a thirteenth century cathedral and several Renaissance buildings. Pop. (1954) 18,200.

CREMATION, the process of disposing of the bodies of the dead by reducing them to ashes. In early times it was much more widely employed than simple burial, and was the general practice of the civilized world in the pre-Christian Era. The exceptions to this rule were Egypt, China, and Judea, where belief in the resurrection of the body was no doubt the major cause of resort to embalming and burial in preference to burning. With the spread of Christianity throughout western Europe, however, cremation was gradually supplanted by the Christian rite of burial, which was enforced by a body of ecclesiastical and civil laws.

Active agitation for the reintroduction of cremation began in the late seventeenth century but did not become really effective until the nineteenth century. The major argument in favor of the practice was that, with the rise of large population centers, proximity to overcrowded graveyards often constituted a peril to life and health, especially in cases of epidemics. In the twentieth century legal obstacles to cremation have largely been overcome, and it has gained ground in both Europe and the United States, though there is still much opposition to its general acceptance.

Modern cremation is an altogether different process from that which was employed by the ancients. The high temperature furnace has replaced the slow burning pile of wood. The casket is lowered into a retort of fire clay and asbestos in which a fine spray of oil produces intense heat. The time required for cremation is from 50 to 80 minutes. The remains, four to six pounds of white mineral residue, are placed in a sealed metal receptacle. See BURIAL.

CRÈME DE MENTHE, a white or green plant liqueur flavored with extract of mint. It is produced by distilling mint and brandy in a pot still after the mint (usually peppermint) has been soaked in the brandy for 24 to 48 hours. The distillate, sweetened with sirup, is aged in a vat. Naturally colorless, the liqueur is made green by using a harmless artificial dye before aging. Crème de menthe is an ingredient in many cocktails and highballs.

CREMER, SIR WILLIAM RANDAL, 1838–1908, British peace advocate, was born in Wiltshire. Prominent in the trade union movement, he served in the House of Commons, 1885–95, and 1900–08. In 1887 he founded the Inter-Parliamentary Conferences to further the cause of peace and edited the pacifist journal, *Arbitrator*. In 1903 he was awarded the Nobel peace prize, with which he endowed the International Arbitration League.

CREMONA, province, N Italy, Lombardy, bounded by the provinces of Bergamo and Brescia on the N, Mantua on the E, Parma on the S, and Milan on the W; area 678 sq. mi.; pop. (1954) 378,200. The province is made up of a fertile section of the Po River Valley lying between the Adda and Oglio rivers. Agriculture is the main occupation, and irrigation is extensively practiced. Wheat, rice, corn, flax, and silk are the leading products. Cattle and hogs are the most important livestock. Manufactur-

CHICAGO ART INST.

The home of master violin makers from the sixteenth to eighteenth centuries, Cremona is dominated by its twelfth century cathedral with a terra cotta ornamented facade.

ing, principally textiles, is conducted in the provincial capital, Cremona, and in Crema.

CREMONA, city, N Italy, Lombardy, capital of the province of Cremona, on the Po River, 45 miles SE of Milan. Cremona is a communications, market, and industrial center located in a productive agricultural region. Leading manufactures are textiles, clothing, pottery, musical instruments, metal goods, and food products. The chief architectural feature is the cathedral, dating from the twelfth century. Nearby is a twelfth century baptistery and a thirteenth century campanile, 397 feet high. The cathedral and several fine medieval churches contain paintings by artists of the Cremonese school. The city has several museums. Cremona, founded in 218 B.C. by the Romans, was renowned during the Middle Ages as an intellectual center. The Amati, Stradivari and Guarneri families, famous violin makers, lived in Cremona during the sixteenth, seventeenth, and eighteenth centuries. Pop. (1954) 56,200.

CREOLE, from French *créole*, or Spanish *criollo*, meaning native or domestic, a person of European descent born in the French and Spanish possessions of America. The creoles in Spanish America were distinguished from the Indians and persons of mixed blood on the one hand and the Spanish-born *peninsulares* on the other. Creoles held minor offices and had some professional and commercial positions, but generally felt unfairly treated. They were leading figures in the revolutions and the republican governments of Spanish America. In Louisiana creoles were the descendants of the French and, to a lesser extent, Spanish settlers of colonial days, as distinguished from the later settlers of British descent. New Orleans and Louisiana were strongly influenced by the creole character and culture.

In later usage people of mixed blood were called creoles, especially in Brazil and Peru, as were Negroes born in the Americas to distinguish them from those born in Africa, and persons of mixed Russian and Indian blood in Alaska. Creole language is a *patois* or variation, especially of French, developed in the colonies.

CREOLE CASE, a diplomatic incident involving the United States and Great Britain, arising out of a slave mutiny aboard the ship *Creole*, Nov. 7, 1841. The *Creole* was bound from Hampton Roads, Va., to New Orleans when the slaves overpowered the crew, killed one owner, and took the ship into the harbor of Nassau. British authorities held those slaves who were charged with murder and released the others. Secretary of State Daniel Webster unsuccessfully demanded the return of the slaves; after several years an Anglo-American commission set up in 1853 awarded damages of $110,330 to the United States.

CREON, in Greek legend, brother of Jocasta, the mother of Oedipus. Creon governed Thebes until Oedipus was called to the throne. Later, after the sons of Oedipus (Eteocles and Polynices) had fallen, Creon ruled the city again and executed his grandniece Antigone (Oedipus' daughter) for having buried Polynices contrary to his orders. See ANTIGONE; OEDIPUS.

CREOSOTE is a mixture of chemical compounds obtained from distillation of wood tar or coal tar. The mixture is characterized by high boiling points and high viscosity.

Creosote obtained from coal tar is usually yellowish but becomes colorless when heated to temperatures above 38°C. The oily liquid has a characteristic aromatic odor and consists principally of liquid and solid hydrocarbons, tar acids, and tar bases (see COAL TAR), with a boiling point range of 200°C to 400°C. A mixture of creosote and coal tar is frequently used as a wood preservative to protect against fungi, marine borers, and insects. See WOOD PRESERVATION.

Creosote obtained from the distillation of wood (see WOOD DISTILLATION) varies widely in composition, but in general is a clear to yellowish mixture of phenolic compounds (see PHENOLS; CRESOL) with a boiling point range of approximately 203°C to 220°C and a characteristic odor of smoke. Wood creosote is partially soluble in water but completely miscible with alcohol or ether. It is used as an external antiseptic in medicine and dentistry. The amount of mucus in the chronic stage of bronchitis can be reduced by the expectorant (see EXPECTORANT) action of wood creosote. There is no evidence that wood creosote is effective as an internal antibacterial agent.

CREOSOTE BUSH, an evergreen shrub that is a characteristic part of the desert flora in southwestern United States, Mexico, and South America. The North American species, *Larrea tridentata*, family *Zygophyllaceae*, is a profusely-branched plant that grows to a height of 10 feet. It bears small green leaflets, terminal yellow flowers, and small globe-shaped white fruits. The branches are strongly scented and resinous.

CRERAR, HENRY DUNCAN GRAHAM, 1888– , Canadian general, was born in Hamilton, Ont., and was graduated from the Royal Military College of Kingston. After service with the artillery in World War I, he was professor and later director of the Royal Military College. He was chief of the general staff, 1940–41, and in 1942 became commander of the First Canadian Corps, which saw action in Sicily and Italy. Promoted to general, 1944, he commanded the first Canadian army until 1946, when he retired from active service.

CRERAR LIBRARY, full name The John Crerar Library, a scientific and technical reference library in Chicago, for which John Crerar (1827–89) provided in his will. The library first opened in 1897; its present 15-story building was completed in 1920. Five of its floors are leased for business purposes. The six stack floors, built as a unit, were designed to accommodate about 110,000 volumes each. In 1956 the John Crerar Library had some 580,000 bound volumes and more

than 400,000 pamphlets devoted principally to scientific and technological subjects, with emphasis on chemistry, physics, medicine, and engineering. In zoology and botany its resources were integrated with those of the Chicago Natural History Museum.

CRESCENT, the increasing or new moon, which shows a curving rim of light terminating in points or horns. Symbol of the Ottoman Turks, the crescent is depicted on the Turkish standard, and generally represents Turkish dominion, or the "empire of the Crescent." In heraldry the crescent is an "honorable ordinary," often used as a mark of distinction by the second sons of families, or by those descended from them. The crescent figured prominently in the religious symbolism of ancient Egypt because on certain dates the morning sun on the horizon appeared as crescent-shaped, a fact which was associated in the Egyptian mind with the shape of the Nile River delta. This coincidence made the crescent a powerful symbol to the astrologically oriented Egyptians, whose lives were regulated by the seasonal floodings of the Nile.

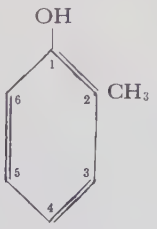
CRESCENT CITY. See New Orleans.

CRES ISLAND, Italian Cherso, in the N Adriatic Sea, NW Yugoslavia, forming part of Croatia, lying SE of Istria; area 198 sq. mi.; pop. (1954) 12,471. Cres is an irregular, elongated island stretching for about 40 miles from north to south and generally less than 5 miles in width. It rises to a maximum elevation of more than 2000 feet in the north. Sheep raising, fishing, and mixed agriculture are the main occupations. The old towns of Cres and Osor are the chief centers. Cres Island is linked by bridge at Osor with Lošinj Island to the south. In 1918 Cres Island passed from Austro-Hungarian control to Italy and in 1947 became part of Yugoslavia.

CRESOL, a class of organic compounds obtained from coal tar, wood tar, and shale oil. The cresols have a melting point close to room temperature and hence occur both as a colorless crystalline solid and oily liquid. The compounds are poisonous if taken internally or inhaled, and will cause severe skin burns. Cresols are used in the manufacturing of phenol-aldehyde condensation products or phenolic resins such as bakelite (see Resin). An equal mixture of soap solution and cresol is frequently used as a disinfectant because of its germicidal properties.

Three chemical compounds, of the general formula $C_6H_4(CH_3)OH$, comprise the cresol class. They all have the same composition, but differ in structural arrangement (see Isomerism) and in some chemical properties. A cresol molecule may be regarded as a phenol molecule (see Phenols) in which one of the hydrogen atoms has been replaced by a methyl (CH_3) group.

Solid ortho cresol, also called 2-methylphenol, becomes a liquid at 31°C and boils at 191°C. Structurally it differs from the other two cresols in having a methyl group on the second carbon atom.



2-methylphenol

Meta cresol, also called 3-methylphenol, has the methyl group (CH_3) on the third carbon atom. It is a liquid at room temperature, boils at 203°C and solidifies at 10°C. The third cresol is para cresol, also called 4-methylphenol. It boils at 201.8°C, melts at 34.7°C, and has a methyl group on the fourth position. See Organic Chemistry, *Cyclic Compounds.*

The chemical reactions of cresols are similar to the reactions of phenol. Cresols are mildly acidic, soluble in sodium hydroxide and most organic solvents, but only partially soluble in water. The compounds enter into chemical reactions similar to the reactions of phenol, such as nitration, chlorination, and hydrogenation. (See Nitration; Chlorination; Hydrogenation.) The methyl group is immune to oxidation by chromic acid. A mixture of the three cresols is sometimes called cresylic acid, but the name is more properly applied to a mixture of phenols boiling above the cresol range. See Coal Tar.

CRESS is any of a number of herblike plants belonging to the mustard family, *Cruciferae.* The pleasantly pungent leaves are used in salads, for seasoning, and for garnishing.

Watercress

The familiar watercress, *Roripa Nasturtium-aquaticum* (*Armoracia rusticana*), favored for its pungent leaves and tender shoots, is the species most generally used in the United States. It was naturalized from Europe and is found growing in nearly every state from Georgia to California. It thrives as a perennial in clear, cold water of running streams and pools. The plants float in the water or creep along the banks. The leaves are pinnate, with one to four or more small rounded segments and a large terminal one. Roots develop freely at the nodes, where leaves appear normally. White flowers appear in small racemes at the end of shoots. The fruit is a curved silique. This plant is sometimes known under the name *Radicula,* and bears in addition the names *Sisymbrium Nasturtium-aquaticum, Radicula Nasturtium-aquaticum.*

The garden cress, *Lepidium sativum,* is widely distributed in the Northern Hemisphere and is cultivated for its basal leaves. It is easily grown and the seeds sprout rapidly. Garden cress is often seen growing wild along roadsides.

Some other species of edible cress are included in the genus *Barbarea,* winter cress. The species *B. vulgaris,* known as upland cress or yellow rocket, is also from Europe, naturalized in North America. *B. verna,* known as early watercress or Belle Isle cress, is widely used in the South.

The bitter cress, genus *Cardamine,* includes several species growing in swamps and along the edges of streams. *C. pratensis,* cuckooflower, is one generally found in northern Europe, Asia, and North America. This species has showy white or rose-colored flowers a half-inch across. The leaves are slightly bitter and are often used as a substitute for the true watercress.

CRESSENT, CHARLES, 1685–1768, French furniture maker, was born in Amiens. After studying with Charles André Boulle, whom he imitated in his early work, Cressent began producing the original pieces for which he was to become famous. His fame rests not only on his woodwork and designs, but also on the beautiful carving, gilt work, and statues used to embellish his furniture.

CRESSY. See Crécy.

CREST, the heraldic figure surmounting a helmet. Although crests were worn on the summits of helmets in preheraldic ages, it is for their heraldic significance that they are remembered. By a popular misconception the crest is often supposed to be the most important item in an armorial achievement; actually the coat of arms is complete without it, and in many cases the crest is absent altogether. Adoption of

Crest

crests and their forms, even after heraldry became systematized and hereditary, were more subject to the caprices of the wearer than were the bearings of the shield, which could be modified only with the sanction of the heraldic authorities. See HERALDRY.

CRESTLINE, village, N central Ohio, in Crawford County, on the New York Central and the Pennsylvania railroads and U.S. Highway 30N; and 11 miles W of Mansfield. Chief manufactures are truck bodies, snow plows, and concrete and plastic products. Pop. (1950) 4614.

CRESTON, city, SW Iowa, county seat of Union County, near the Platte River, on the Burlington Railroad and U.S. Highway 34; and 55 miles SW of Des Moines. Creston is a shipping point for farm produce, livestock, and bluegrass seed. The city has railroad repair shops and a meat packing industry. The area was settled in 1854 and the city was incorporated in 1871. Pop. (1950) 8317.

CRESTVIEW, town, NW Florida, county seat of Okaloosa County, on the Louisville and Nashville Railroad and U.S. Highway 90; 46 miles NE of Pensacola. Industries deal with lumber and naval stores and clothing manufacture. Eglin Air Force Base is 5 miles south. Pop. (1950) 5003.

CRESWELL, JOHN ANGEL JAMES, 1828–91, U.S. cabinet officer, was born in Port Deposit, Md. Creswell was graduated from Dickinson College. He was a congressman, 1863–65, and U.S. senator, 1865–69. As postmaster general under President U. S. Grant, 1869–74, he speeded mail service, reduced postage, and increased facilities.

CRETACEOUS PERIOD, the third and final period of the Mesozoic era (see MESOZOIC ERA). It lasted approximately 50 million years, beginning about 120 million years ago. *Cretaceous* is derived from the Latin *creta*, for chalk, which, such as the chalk cliffs of Dover along the English Channel, formed in large amounts during this period. The Cretaceous period is often divided into Lower Cretaceous (Comanchean) and Upper Cretaceous period. See GEOLOGIC TIME.

The terrain of North America was greatly different during the Cretaceous period. A sea 1000 miles wide extended from the Gulf of Mexico to the Arctic Ocean and engulfed parts of Mexico, Texas, Oklahoma, Kansas, Iowa, the Dakotas, the western part of Canada, and almost the whole of Alaska. Sedimentary deposits ranging up to 20,000 feet endowed this area with a wealth of fossils and profound geographic formations. Typical Cretaceous deposits are found in eastern Colorado, western Kansas, and Nebraska, where a layer of sandstone is covered with several hundred feet of shale. The shale, in turn, is overlaid with limestone consisting of shells and bones of sea animals cemented together by precipitated calcium carbonate. Large deposits of chalk that are almost wholly the remains of one-celled sea animals cover the limestone layers in parts of Kansas, Nebraska, Colorado, Oklahoma, and Texas. The climate during the Cretaceous Period allowed tropical trees, such as figs and palms, to grow as far north as Greenland. The accumulation and decay of this vegetable matter resulted in coal deposits extending eastward from the Rocky Mountains and giant oil fields in parts of Texas, Wyoming, Montana, and New Mexico.

The seas during this period abounded with great numbers and kinds of life. Clams and Cephalopoda (see CLAM; CEPHALOPODA) were in great abundance, as were fishes with long sharp teeth. During the Cretaceous the greatest number and kinds of reptiles occurred; the carnivorous dinosaurs and herbivorous dinosaurs, which included the duck-billed, horned, and armored (see DINOSAUR), lived in great numbers with flying reptiles and birds. A great array of flowering plants and trees accompanied the growth of insect groups, and the insects in turn encouraged the growth of smaller birds, mammals, and reptiles who fed on them.

During the late Cretaceous period modern mountain systems were born and the young Rockies raised themselves from the formerly flat planes. The tropical lowlands retreated before the hard wood forest and the humid warm climate was gradually replaced by fluctuating temperatures. Many of the creatures became highly specialized during this period and when earthly changes occurred they were not able to adapt to their new environment; hence they were slowly replaced by warm-blooded, less specialized smaller animals. The end of the Cretaceous Period, 70 million years ago, ushered in the Cenozoic (see CENOZOIC) or the present era.

CRETE or **KRITI,** an island in the E Mediterranean Sea, S of the Aegean Sea; an administrative division of Greece, containing the provinces of Khaniá (Canea), Herákleion (Iráklion), Lasíthi (Lasethi), and Rethímni (Rethymne); about 60 miles SE of the Peloponnesus; area 3234 sq. mi.; pop. (1951) 463,459. The island is about 160 miles from east to west, and varies in width from 7 to 35 miles. The people are mostly Greek in nationality and Greek Orthodox in religion. See map of Greece in Atlas, Vol. 20.

Physical Factors. Crete is a rugged mountainous island with about 10 per cent of the island less than 300 feet above sea level and about 45 per cent below 1300 feet in elevation. There are five mountain groups, from west to east: Mount Leuka (Levka), 8661 feet; Mount Ida (Idhi), 8878 feet; the Kophinos Mountains, 4039 feet; Dikte (Dhíkti), 7048 feet; and the Sitía Mountains, 4839 feet. The structure of the island is chiefly folded metamorphic rock overlain with limestone and some alluvium. The south coast is rugged and indented only by Mesará (Messara) Bay. To the east of the bay is the Mesará Plain, drained by the Yeropótamos and Anapodháris rivers. The north coast is more accessible and has extensive alluvial plains. Indentations from west to east are the Gulf of Kisamos (Kisámou), the Gulf of Khaniá (Canea), Suda (Soúdha) Bay, Yeoryioúpolis Bay, the Gulf of Herákleion (Iráklion or Candia) the Gulf of Mallión (Malea), the Gulf of Merabéllo (Mirabella), and Sitía Bay. Chief rivers of the north are the Platanías, flowing north from Mount Leuka, and the Milopótamos, flowing northwest from Mount Ida. None of the rivers are navigable. Lake Kournás, 160 acres, located near the northwest coast, is the largest fresh-water lake on the island. The average amount of rainfall received annually varies from 28 inches along the northwest coast, decreasing to 8 inches on the southeast coast. The mean temperature along the coastal plain is 65°F. In the interior there are higher seasonal fluctuations. There are evidences that Crete was covered with a dense cypress forest in ancient times. Only small groves of pine, oak, and cypress remain, covering about 2 per cent of the total land area.

Broken steps and crumbling pillars mark the site of a Middle Minoan palace, built about 1800 B.C. The earlier culture of the island dates back to the Aegean Bronze Age.

BURTON HOLMES—EWING GALLOWAY

BURTON HOLMES–EWING GALLOWAY

Peasants of Phaestos, an ancient mountain town of Crete, still wear the conventional headdress and sash. Other garb includes short jackets, wide trousers, and high boots.

BURTON HOLMES–EWING GALLOWAY

As in past centuries, yoked cattle and crude implements are still used by the Cretan farmer. The principal crops are citrus fruits, olives, carob beans, grapes, and nuts.

Economic Factors. About 30 per cent of the total land area is in agricultural production, although 90 per cent of the population is rural. The principal agricultural products are citrus fruit, olives, carob beans, grapes, barley, potatoes, almonds, and acorns. Sheep, goats, cattle, and pigs are raised. Talc and lignite are the only mineral products exploited, although there are traces of iron, gypsum, zinc, copper, lead, and manganese found on the island. Food products, clothing, and building products are the chief processed items. The principal imports, by volume are: food, 25 per cent; building and construction materials, 30 per cent; fertilizer, 10 per cent; and fuels, 10 per cent. The chief exports by volume are: citrus fruit, 40 per cent; wine, 25 per cent; carob beans, 20 per cent; and olive oil, 10 per cent. All of the citrus fruit, 80 per cent of the wine and raisins, and 10 per cent of the olive oil and carob beans are sent to foreign countries.

Crete is traversed by a highway parallel to the northern coast. The interior and southern part of the island are reached by branches off this artery. Much of the island is accessible by footpaths only. Rail transportation does not exist. Several commercial airlines connect with the mainland. Khaniá (Canea) and Herákleion (Iráklion or Candia), both north coast ports, are the chief commercial centers.

Archaeology. Crete, one of the most important archaeological areas of the world, has remains indicating continuous human habitation since 4000 B.C. and a notable early civilization. The prehistoric remains have been explored systematically since 1894, especially by Sir Arthur Evans at Cnossus from 1900 to 1924. The earliest settlers probably came from southwest Anatolia. Excavations in eastern and central Crete have revealed caves that were inhabited by people in the Neolithic age. There are some signs of communication with Anatolia and Egypt.

The periods following the Neolithic have been called Minoan and are divided generally into Early, from about 2800 to 2100 B.C.; Middle, 2100 to 1600 B.C.; and Late, 1600 to before 1100 B.C. Towns and villages were settled in the Early Minoan period; bronze was used and arts and crafts were developed. The remains indicate an increased population, probably in part the result of migrations from Asia Minor. There is also evidence of direct trade with Egypt.

During the Middle Minoan period the monumental palaces at Cnossus, Phaestos, and Malea arose. The frescoes decorating palace walls, the pottery vessels, and the engraved stone seals are demonstrations of the high artistic achievements of the period. Writing began with a hieroglyphic style and developed into several linear scripts. The Minoan Linear B script was known for a long time, but was undeciphered. In 1953 Michael Ventris claimed he had deciphered it and found the language represented to be an early form of Greek. Similar writing was found in a Mycenaean palace at Pylos, in mainland Greece, indicating a close early connection between Minoan civilization and contemporary Greece.

During the Middle Minoan period, the culture of the whole island of Crete was more nearly unified than heretofore. Cnossus apparently became the leading political power. Trade relations with Egypt, Syria, and Mesopotamia are indicated in the remains. In the Late Minoan period Cretan power expanded, and Cnossus became capital of a rich trading empire dominating the Aegean and powerful throughout the eastern Mediterranean. Archaeologists have estimated the population of Crete in the sixteenth century B.C. at 1.2 millions, a higher figure than in any later period. Luxurious homes were built; the great palaces already erected were elaborately altered, and new structures were added to them. The great palace at Cnossus in its final stage was a large, complicated construction, with a great number of rooms, corridors, and courtyards at various levels. Handsome, lively frescoes, sometimes striking in their modernity, decorated the walls.

The Minoan religion was a worship of nature, centering on a Mother Goddess or Earth Mother. Mountain caves and sanctuaries served for religious worship. Minoan civilization, unlike Egyptian and other early civilizations, did not develop a monumental religious architecture. Pillars were important in Minoan religion; the palaces and some private houses have shrines about pillars. There were a number of important religious symbols. Apparently the bull had religious significance, giving rise to later Greek accounts of the Minotaur and the Labyrinth. See MINOTAUR; LABYRINTH.

About the beginning of the fourteenth century, the Minoan civilization on Crete fell. Although the causes are not clear, economic factors, an invasion from Greece, or an earthquake have been suggested. The great palaces and cities declined and small communities arose in their places. Crete became a minor part rather than the center of the Aegean world. Many aspects of Mycenaean and later Hellenic civilizations derived from the Minoan. See MYCENAEAN CIVILIZATION; GREECE, History; ARCHAEOLOGY, *Crete and the Aegean Sea.*

History. Archaeological discoveries have confirmed or explained some of the Greek legends and traditions about the Crete of King Minos and the Minotaur. For Homer, it was "hundred-citied" Crete, whose king, Idomeneus, led one of the contingents in the expedition against Troy. At Gortyna is preserved one of the earliest Greek legal codes. The Cretans were neutral in the struggle between the Greek cities and the Persian Empire. In the period following the Persian Wars, they were divided into

independent cities, notorious for their quarreling, though an attempt was made at arbitration of disputes in the Cretan League. Crete was a notorious haven for pirates in the third and second centuries B.C. Its cities supported Mithridates in his war against Rome, which conquered and annexed them in 67 B.C. From the time of Augustus Crete was united with Cyrene as a Roman province.

There was a Christian community on Crete as early as the lifetime of St. Paul (Titus 1:5–16). In the later division of the Roman Empire, it became part of the eastern portion. It was taken by the Saracens in 823, and reconquered by the Byzantines in 961. In 1204 the island fell to the forces of the Fourth Crusade in its attack on the Byzantine Empire. Crete was given to Boniface of Montferrat, who sold it to Venice. There were several unsuccessful revolts against Venetian rule. The Turks attacked in 1645, and met fierce resistance. Candia (Herákleion) withstood a long siege before it fell in 1669, and segments of the island held out still longer. Some of the population became Moslem; most remained Orthodox Christian.

New revolts in 1821 against the Turkish rule accompanied the Greek revolution. Mohammed Ali held Crete from 1831 to 1840, after which it was recovered by the Sultan. Major revolts occurred in 1866, 1878, and 1897, the last of them leading to war between Greece and Turkey and to an agreement in 1898 by which Prince George was made high commissioner of Crete. The island was under the nominal suzerainty of the Ottoman Empire, the protection of Great Britain, France, and Russia; and the actual control of Greece. An elected assembly was established. Cretans demanded reunion with Greece, and fought on the side of Greece in the Balkan Wars. In 1913 Turkey formally renounced sovereignty, and Crete became part of Greece. (See also VENIZELOS, ELEUTHERIOS.) In the nineteenth and early twentieth centuries most of the Moslems were reconverted to Christianity or emigrated. Almost all those who had remained on Crete were transferred to Turkey in the exchange of populations following World War I. (See LAUSANNE, TREATY OF.) The Cretan population was thus left almost entirely Greek in nationality and Orthodox Christian in religion.

The island, strategically important in World War II, was occupied and fortified by the British in October 1940. The king and the Greek government fled to Crete when the mainland fell to the Germans and Italians, Apr. 23, 1941. On May 20 the island was assaulted by a German force of more than 10,000 in a spectacular invasion. (See WORLD WAR II, Greece and Crete.) Two days later, king and government fled to Egypt. The British lost two cruisers and four destroyers in the attempt to relieve the island, and finally evacuated it. The guerrilla activity, however, kept a German force of 60,000 in occupation. It was estimated that 10,000 Cretans lost their lives and 60 villages were destroyed by the occupation forces.

At the end of the war, Crete, like the rest of Greece, had the task of rebuilding and rehabilitation. With the aid of the United States government and private funds and technical assistance, harbors were improved and roads and airfields built, including bases for the United States under an agreement signed in 1953. In March 1956, there were anti-British riots in Candia over the Cyprus issue.

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CRETINISM, a congenital condition of infancy, characterized by deformity and resulting from a severe deficiency of the hormone thyroxin secreted by the thyroid gland (see THYROXIN; THYROID GLAND). When thyroxin deficiency occurs in adults or in children past infancy, the disease known as myxedema occurs (see MYXEDEMA). Cretinism begins before birth or in early infancy and unless treated results in irreparable damage including changes such as stunted growth and idiocy (see IDIOCY). Children with this disease are slow to sit up, walk, and talk. They appear squat and potbellied, with short arms and legs and very large heads. They have bloated faces, with particular puffiness about the eyes, and their thick, broad tongues protrude from constantly parted lips. These children have coarse voices and never learn to talk clearly. Cretinism is relatively common in goiter-belt areas where insufficient iodine intake by the mother may result in lack of thyroid development in the fetus (see GOITER); as a preventive measure supplementary iodine is given to pregnant women in these areas. Occasionally cretinism occurs as the result of a missing or defective thyroid gland. If cretinism is diagnosed early, thyroid preparations can be given to promote and maintain normal growth and mental development, but treatment must continue for life.

CRETONNE, a firmly woven, printed cloth made of cotton, linen, or rayon. Used mainly for such purposes as draperies and upholstery, in lighter weights it may be made into informal clothes for women and children. Cretonne is reversible when made with a printed warp and plain filling. It is unlike chintz in that the fabric is unglazed. The name is taken from its originator.

CREUSE, department, central France, bounded by the department of Indre and Cher on the N, Allier and Puy-de-Dôme on the E, Corrèze on the S, and Haute-Vienne on the W; area 2164 sq. mi.; pop. (1954) 172,702. The department, generally mountainous, includes the western extensions of the Massif Central and the Plateau of Millevaches. The Creuse River is the principal stream. Agriculture is the dominant occupation with potatoes, rye, hemp, fodder, and chestnuts the most important crops. Cattle and sheep are the chief livestock. Coal is mined in the central section. The leading manufacturing centers, principally noted for textiles, are Guéret, the capital and Aubusson.

CREUSE RIVER, central France, rises on the Plateau of Millevaches, in the department of Creuse, and flows generally NW through Indre, Vienne, and Indre-et-Loire, to join the Vienne River below La Haye-Descartes. The Creuse River has a total length of about 155 miles and is noted for its scenery.

CREUSOT, LE, town, E central France, in the department of Saône-et-Loire; it is 75 miles NNW of Lyons. Le Creusot is situated in a coal producing region and is an important metallurgy center. The Schneider munition works, established in 1837, are now government controlled. During World War II, Le Creusot was heavily bombed. Pop. (1954) 27,394.

CREVAUX, JULES NICOLAS, 1847–82, French explorer, was born in Lorquin, Lorraine. He made four journeys through unexplored parts of South America, 1877–82, and was the first European to penetrate the interior of Guiana to the Tumuchumac Mountains. On his last expedition he was killed by Tobas Indians on the banks of the Pilcomayo River. Crevaux wrote *Voyages dans l'Amérique du Sud* and *Fleuves de l'Amérique du Sud* (1883).

CRÈVECOEUR, MICHEL GUILLAUME JEAN DE, 1735–1813, French writer under the pseudonym "J. Hector St. John," was born near Caen, Normandy. He emigrated to America in 1754, traveled in several colonies, and in 1765 became a citizen of New York colony and bought a farm in Orange County. During the Revolutionary War Crèvecoeur was imprisoned by the British as a spy, 1780, but later in the same year was released and went to

France. Returning as the French consul in New York, 1783, Crèvecoeur corresponded with George Washington, and was a friend of Benjamin Franklin and Thomas Jefferson. He again returned to France in 1790, remaining there until his death. Crèvecoeur wrote many essays on farming, published as *Letters from an American Farmer* (1782). He also wrote *Voyage dans la haute Pensylvanie et dans l'état de New-York* (3 vols. 1801). His unpublished manuscripts, discovered in 1922, appeared in *Sketches of Eighteenth Century America* (1925).

CREVE COEUR, village, N central Illinois, in Tazewell County, on the Illinois River and state highway 29; 4 miles S of Peoria. Fort Creve Coeur State Memorial is located 2 miles north of the village. Pop. (1950) 5499.

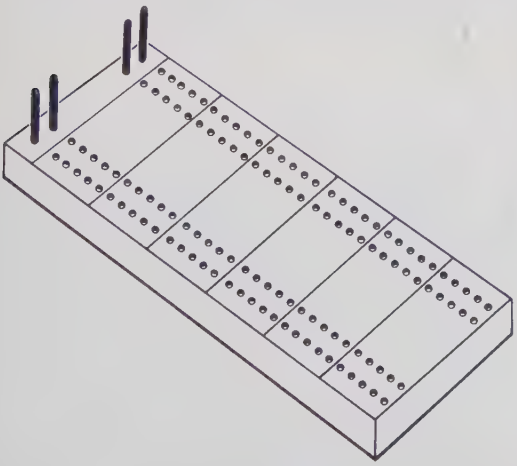
CRÈVECOEUR, FORT DE, an early French outpost in the Illinois country, established by René Robert Cavelier, Sieur de la Salle, in 1680 on the Illinois River near the present site of Peoria. La Salle constructed it for protection from the Indians and as a base for his planned expedition down the Mississippi. In the spring of 1680 La Salle set out for Canada, leaving Henri de Tonti in command. While Tonti also was absent, the fort was pillaged and destroyed by the garrison.

CREWE, municipal borough, W central England, S central Cheshire, 28 miles SSW of Manchester. Crewe is an important railroad junction and manufacturing center for railroad equipment. Other manufactures include clothing, food products, and chemicals. Pop. (1951) 52,415.

CREW RACING. See Rowing.

CRIBBAGE, a card game said to have been evolved from noddy, a popular game of the day, by Sir John Suckling of England in the early seventeenth century. Essentially a two-hand game, cribbage may also be played by three or four. Because points come so rapidly scoring is done by means of pegs on a cribbage board with four rows of 30 holes each. An extra hole at the end of each row is termed the game hole. Beginning points are scored with the first peg in the outer row beginning at the game end; subsequent points are tallied by moving the rear peg ahead of the advance peg. The game is usually played for 121 points, twice around; a variation is a 61-point game.

In cribbage the regular 52-card pack is used, with suits being of little or no importance. Kings are high, aces low, with face cards having a value of 10. All other cards have the usual "spot" or "pip" value. The object of the game is to obtain and play cards in scoring combinations—15s, pairs, runs or sequences of three or more, flushes (four cards of the same suit), or nobs (jack in the hand or crib of the starter suit).



Cribbage Board

Play begins by shuffling the deck and cutting for deal, with the low card drawn designating the dealer. The dealer then reshuffles, the deck is cut, and six cards are dealt to each player, one at a time. Each player then selects two cards to be laid away to the crib (an extra hand of discards which belongs to the dealer). The remaining cards in the deck are again cut, and the top card is turned face up as a "starter," which is not used in play but only in counting. The nondealer opens play by laying a card face up on the table, announcing its value. The dealer then plays in the same way, announcing the sum of the count. Play continues until a player cannot add a card without the total of pips exceeding 31. He then announces "go," and his opponent continues to play additional cards so long as he does not exceed 31. If he scores exactly 31 he pegs two; otherwise he pegs one for "go."

In addition to points pegged for 31 and for "go," points are counted for combinations in hands or crib after play. For 15s accrued by any combination of two or more cards, two points are pegged. Pairs count two in playing or in hand, for "pairs royal" (three of a kind) six are pegged. "Double pairs royal" are four of a kind and count 12. Sequences score as many points as there are cards in the sequence, flushes score one for each card in the suit, and nobs one. In the counting of hands or "showing," the nondealer shows first, then the dealer, and finally the crib. The first player to show a total of 121 wins the game, even though his opponents could exceed that score if given a chance to show. When three persons play, each plays for himself and scoring is done on a triangular cribbage board; when four play, cribbage is a two-partnership game and the play continues to a 121-point total. In both the three-hand and four-hand game only five cards are dealt each player, one of which must be discarded from each hand to the crib. On a "go" the remaining players continue, the last to play scoring for the "go." O. R. S.

CRICHTON, JAMES, 1560–?85, Scottish scholar and adventurer known as The Admirable Crichton, was born in Dumfries. After graduating from St. Andrew's in 1575 he went to Paris, where he is said to have argued on scientific topics in seven languages. He served in the French army, 1577?–79. He then went to Genoa to deliver an elaborate Latin address to the doge. He challenged many subjects and once disputed with virtually the whole University of Padua on matters of Aristotle and mathematics, emerging the victor after four days of debate. A skillful swordsman, he neglected no opportunity to demonstrate his prowess, and died in a brawl. Crichton's surviving literary work consists of odes and orations addressed to Italian nobles and scholars.

USDA

Black Field Cricket

CRICKET, a member of a generally nocturnal family of grasshopper-like insects related to the mantids, katydids, and cockroaches. Crickets comprise the family *Gryllidae*, order Orthoptera. The cricket's head is somewhat rounded, with long and slender antennae. The wings are closely folded lengthwise and frequently may be entirely absent or degenerate. Each of the male's forewings is provided with a stridulating file. When the male rubs the wings together, these files produce the characteristic chirping

song of its species. The hind legs, usually composed of three tarsal segments, are long and adapted for jumping. Definite organs of hearing are located on the front legs. Both sexes have two long, flexible vestigial structures called cerci located near the tip of the abdomen. In the females of most species a needle-like ovipositor is located at the posterior tip of the abdomen (see INSECT). The females are fertilized by means of peculiar spermatophores, specialized spore-containing capsules, and as in related animals there is a gradual or direct metamorphosis in which stages anatomically resemble each other.

The most common crickets in the United States are the black, or field, crickets belonging to the genera *Gryllus* and *Nemobius*. Most of these crickets are less than one-half inch in length, although some species may reach lengths of almost an inch. The black cricket, *G. assimilis*, often enters houses and feeds upon clothing, rugs, and upholstery. In the fields these crickets can be controlled by using sodium arsenite, $NaAsO_2$, and in the home by spraying of 2 per cent chlordan or 5 per cent DDT, or by dusting with 5 per cent chlordan or 10 per cent DDT.

The European cricket, *G. domesticus*, was the subject of Charles Dickens' *The Cricket on the Hearth*. European crickets are found throughout the United States, living in small burrows in fields and heaths and often entering barns, houses, and even apartment buildings. They remain quiet during the day, but hunt for food during the night. Plants comprise most of the food, but insects are also eaten. Like the black cricket, European crickets chew holes in clothing.

CRICKET, an outdoor game played by two teams of 11 men each, popular throughout most of the British Commonwealth, particularly in England, Australia, India, Pakistan, British West Indies, South Africa, and New Zealand. The early history of cricket is still clouded with conjecture. The French word *criquet* is frequently cited as evidence that the game had its origin in France, but there is no record of the game having been played there in the twelfth or thirteenth centuries, generally recognized as the period in which the prototype of the game was in vogue. Actually, cricket was not invented, but rather was slowly developed or evolved from the earlier games of club ball and stoolball. The progress of the game was not without its difficulties, however, for late in the fifteenth century Edward IV placed a ban on the sport because of its interference with archery. Fines and imprisonment faced both players and owners of the land on which contests were permitted. Later rulers proved more amenable and the game gradually returned, although it was not until 1748 that cricket was legalized. Despite early criticism leveled against the game, as well as the heavy wagering involved, cricket has continued to thrive to the point where it enjoys a status in the Commonwealth comparable to that of baseball in the United States. In the early forms of cricket no wickets were used. Instead, two circular holes were cut into the turf, with a "crease" or line drawn 4 feet in front of each hole. Wickets were first introduced about the beginning of the eighteenth century, with the first official regulations (London Laws) being drawn up in 1744. Further changes in the wicket were made about 1775 by adding a middle stump, the height and width were increased in 1798, and in 1817 the wicket was changed to its present size, 28 by 8 inches. Both the ball and bat have retained their present specifications since 1774.

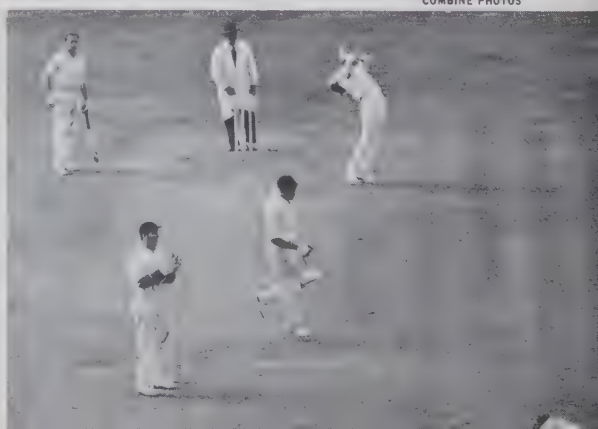
Modern Cricket. The modern form of the game actually coincides with the formation of the Marylebone Cricket Club in London in 1788, and the club has become, in effect, the supreme arbiter of cricket throughout the Commonwealth. The game is played on several levels in England, including county, league, school, and international cricket. Best known of the international competitions, called test matches, are those between England and Australia for The Ashes, a mythical trophy that originated in 1882 as an obituary, several years after the first contest. In the United States cricket has never attained any great degree of popularity, although the game is played to a limited extent along the eastern seaboard.

How Cricket Is Played. The area required for the playing of cricket, approximately 500 by 550 feet, is considerably larger than that of any major league baseball park in America. Eleven players comprise the team with the battery for the game being known as the bowler (pitcher) and the wicketkeeper (catcher). The ball used in cricket has a hard leather cover, is slightly smaller than a baseball, and weighs 5½ to 5¾ ounces. The bat, 38 inches long, has a flat hitting side 4½ inches wide. Gloves and leg pads may be used by the wicketkeeper and batsmen; no other protective equipment is used. Two wickets are used, with an umpire stationed at each. Each wicket consists of three stakes driven into the ground, and has a maximum height of 28 inches and an over-all width of 8 inches. Resting across the tops of the stakes are two bails (wooden strips), each 4⅜ inches long. The wickets are spaced 66 feet apart, facing each other, with the bowler at one, the wicketkeeper at the other. Four feet in front of each wicket, and parallel to it, is a line termed the popping crease.

A regulation game consists of two innings, with all members of both teams having a turn at bat in each inning. The bowler must pitch with a straight arm delivery and may run forward as far as he likes before bowling, but must deliver the ball from the bowling crease. The object of the bowler is to knock down the wickets and bails which the batsman tries to defend by hitting the ball as far as possible and thereupon scoring runs. Two bowlers operate in each game, one at each wicket. After six fair balls have been pitched, the umpire calls "over," and the second bowler pitches to the batsman at the opposite wicket. The bowler thus relieved replaces the new bowler in the field, and all fielders reverse their positions. When the batsman hits the ball, he runs to the opposite wicket, his teammate at that wicket running to the one vacated by the batsman. Running and scoring may continue until the ball is thrown in from the field. When scoring has ceased, the runner at the wicket opposite the bowler becomes the batsman. A batsman may be called out in a number of ways—by letting the bowler hit his wicket with the ball, by flying out to a fielder, by hitting the wicket with his bat, or by a fielder or wicketkeeper hitting the wicket with the ball when the batsman is out of position. No foul balls are called in cricket, the batsman being permitted to hit the ball in any direction—forward, backward, or sidewise. No substitutions are permitted except in case of injury.

Because of the high scoring in cricket, a single game may last for several days. A time limit is set for the day's play, the match continuing from that point on

Action-packed plays are a common occurrence in the final test matches between England and Australia for The Ashes, mythical symbol of cricket supremacy dating back to 1882.
COMBINE PHOTOS



the following day. When a team amasses a substantial scoring lead, the captain may terminate that inning by "declaring," or waiving the remaining batting rights. O. R. S.

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CRICKET FROG, a small, active tree frog common in the warmer portions of the United States east of the Rocky Mountains. The cricket frog, *Acris gryllus*, is five-eighths to 1¼ inches long with its leg length greater than that of the head and body combined. It is brown with a darker triangular patch between the eyes. The ears are distinct. Although the feet are fully webbed, the cricket frog is wholly terrestrial in habit. Cricket frogs are easily distinguished by their long, pointed heads and rough, warty skin. The male's cricket-like song is distinctive. The female cricket frog lays her eggs in May. The tadpoles appear in August and metamorphosis is usually completed in September. Chief food of the adult consists of insects.

CRIEFF, burgh, central Scotland, S central Perthshire, on the Earn River, 16 miles W of Perth. Crieff is a resort center. Antiquities include a twelfth century cross and the ruined fourteenth century Drummond Castle with its famous gardens. Pop. (1951) 5473.

CRIKVENICA, town, NW Yugoslavia, in Croatia, on the Adriatic Sea, about 15 miles SE of Rijeka (Fiume). Crikvenica is a resort noted for its attractive beach and mild climate. Among historical sights are a fourteenth century church and a former monastery. Pop. 2770.

CRILE, GEORGE WASHINGTON, 1864–1943, U.S. surgeon credited with performing in 1905 the first successful direct blood transfusion, was born in Chilo, Ohio. Crile was also known for his studies of shock. Apart from numerous works on surgical subjects he wrote *The Kinetic Drive* (1916); *A Bipolar Theory of Living Processes* (1926); *The Phenomena of Life* (1936); *Intelligence, Power and Personality* (1941); and *Autobiography* (1947). See Shock.

CRILLON, LOUIS BALBIS DE BERTON DE, 1541–1615, French soldier known as "*L'Homme sans peur*" (the man without fear), was born in Murs, Provence. Trained for the army under François de Lorraine, duke of Guise, Crillon distinguished himself in 1558 at the siege of Calais and the capture of Guînes. He fought the Huguenots in the French civil wars, and served with Don Juan of Austria at Lepanto, 1571. As a commander in the army of Henry III, Crillon was active in the war against the Holy League, 1580–89. After the death of Henry III, he fought at Ivry-La-Bataille, 1590, under Henry IV, who called him "*le brave des braves*" (the bravest of the brave).

CRIME

Law violation and detection in terms of their beginnings and modern applications

CRIME, a violation of the law: that is, the commission of an act the law forbids or omission of one it requires, under pain of punishment to be imposed by the state in a proceeding in its own name. If not labeled by the law as a crime, an act or failure to act is not a crime even though it might be shocking to the individual.

The Nature of Crime

A crime is one of several kinds of human behavior usually known as wrongs. Torts and sins are also wrongs, but only crimes and torts are defined as wrong by the law. (See Tort.) Crimes are wrongs that are considered to be so detrimental to the well-being of a society, as judged by its prevailing standards, that action regarding them cannot be entrusted to private initiative or to haphazard methods, but must be taken by organized society in accordance with tested procedures. Even if the victim of a crime takes no action, opposes action, forgives the criminal, or tries to conceal the crime, the state can and may press charges.

Various theories have been advanced to explain the inception and evolution of the concept of crime, among them that it originated in wrongs to individuals for which eventually the community prescribed punishment to reduce the ensuing disorder that tended to endanger the safety of all; that it began in a rational process in which a unified society became aware of wrongs and made regulations to prevent them; that it arose from a crystallization of customs that society sought to protect; and that it sprang from the conflict of interests between groups. Although each of these theories throws some light upon the origin and evolution of various crimes, no one theory, nor all of them together, can give a complete explanation. It would seem on the basis of available evidence that the question can never be satisfactorily answered. When man first became a social being, some of his behavior was even then regulated by collective action. The roots of criminal law were already present in his relationships. See Folkways; Law.

Elements of a Crime. A crime may have two elements: the criminal act or omission, and the mental element called criminal intent or *mens rea*. All crimes derived from the common law, which was brought from England by the American colonists, must have both of these elements; if either is lacking, there is no crime. In some offenses that do not originate in common law, the mere doing of the prohibited act, regardless of the intent involved, may constitute the crime. See Act; Common Law.

It is a general principle of common law that a crime is not committed if the mind of the person committing the act is innocent; therefore, if an individual sincerely believes a book belongs to him, he commits no crime when he takes the book. It is also true that the law does not punish a person for harboring an evil intent if the intent is not expressed in any act. Thus a person may bitterly hate a rival, but if he takes no action to injure the rival, he is not guilty of a crime.

In ascertaining intent, it is necessary to distinguish between intent and motive. (See Intent, *Criminal Intent;* Motive.) Intent is the purpose or resolve of the person to do the act; motive is the desire or inducement that incites or stimulates him to commit the act. Although motive is closely related to intent, it is never an essential element in crime. A person can be guilty of a crime regardless of whether his motive is shown to be good or bad, or even if no motive is proved. If a daughter kills her father to keep him from the suffering of a dread disease, she is guilty of criminal homicide even though her motive be love for her father. By the same token, the law does not punish a person because he has a bad motive if the act is not a crime. An individual who takes a car he believes to be the property of another, although it actually belongs to the person taking it, is not guilty of the crime of larceny. Evidence regarding the motive in a crime is usually admissible in judicial proceedings, however, in order to help establish the identity of the perpetrator of the crime, the intent with which the crime was committed, and the degree of the offense with which he is charged.

Classification of Crimes. Crimes are usually classified as felonies or misdemeanors. Felonies are crimes which the state regards as particularly vicious. They are generally punishable by confinement in a federal or state prison or by the death penalty, depending upon statutory provisions. All other crimes are misdemeanors, and are usually punishable by confinement in jail or by a fine. See Felony; Capital Punishment; Criminal Law; Misdemeanor.

The legal distinction between felonies and misdemeanors has not been clearly preserved in American criminal law, and differs considerably from state to state. An offense that is a felony in one state may be a misdemeanor in another, and sometimes in one state a misdemeanor may be a more serious offense than a felony is in another state. It is still true in general, however, that felonies are more serious than misdemeanors.

Writings on the criminal law make a distinction between crimes *mala in se*, or wrongful from their very nature, and punishable at common law, such as murder, robbery, and rape, and crimes *mala prohibita*, or wrongful because they are prohibited by statute, such as violations of ordinances and regulations designed for better management of the community. The passage of time has made this a highly questionable distinction.

Standard textbooks on criminal law and compilations of statutes use still another classification of crimes, arranging them under headings such as offenses against the sovereignty of the state, including treason; offenses against the person, such as murder and rape; offenses against the habitation, such as arson and burglary; offenses against property, such as larceny and embezzlement; offenses against public health, safety, comfort, and morals, such as bigamy and incest; and offenses against public justice and authority, such as perjury and bribery.

The nonlegal term "white-collar crime" has appeared widely in sociological literature. Originally defined by the late Edwin H. Sutherland, it refers to "a violation of the criminal law by a person of the upper socio-economic class in the course of his occupational activities." For example, a fraud by a realtor in the sale of a house or the misappropriation of a client's funds by an attorney would constitute a white-collar crime. See FRAUD.

Relative Nature of Crime. Crimes are relative to time and place, so that what is legal one day may be criminal the next, and what is criminal in one place may be legal in another. There is no act, except perhaps treason, that is now condemned as criminal that has not at some time or place been considered honorable. In general, at any given time and place the criminal law tends to reflect the values of the individuals and groups in power. The criminal law of the United States has undergone changes through the

SIGNIFICANT STEPS IN THE EVOLUTION OF CORRECTIONAL THOUGHT

Date	Stage of Correctional Development	Significant Influence or Event	Theory of Causation	Type of Treatment	Major Control Group
5000 B.C.	Private vengeance	Tribal taboos	Demonology	Direct and violent	Tribal leaders
2200 B.C.	Group retaliation, beginnings of legal codes	Sumerian and Hammurabi codes	Treated as if personally motivated	Compensation and restitution—Lex talionis (eye for an eye)	Potentates and "divine" leaders
400 B.C.	Individual determinism	Age of Greek and Roman leaders	Unstated, but probably "free will"	Banishment	Emperors, seers, and leaders of cults
A.D. 30	Individual repayment	Death of Christ and spread of Christianity	Revival of Demonism and rise of the devil	Penance—monastic	Church leaders
1215	Inquisition	Magna Charta Spanish Inquisition	Personal responsibility	Physical punishments, torture, the galleys	Church leaders and feudal barons
1600	Emergence of imprisonment for misdemeanants, and of transportation	Creation of houses of correction	Idleness and sloth	Corporal punishments, public executions, transportation to colonies, imprisonment	Deputies and town burghers
1790	Rise of the penitentiary for felons—expiation	French Physiocrats—Cesare Beccaria—Jeremy Bentham—John Howard	Free will	Imprisonment. Expansion of penal colonies in Australia	Parliament—legislators
1830	Solitary incarceration and isolation	Development of penitentiary in United States	Bad environment—poverty and ignorance	Imprisonment, capital punishment, and transportation	Legislators influenced by reformers
1870	Era of reformation	Rise of Lombroso and Italian School with theory of "born" criminal	Free will v. determinism, or a series of causes leading inevitably to crime	Hard labor. Trade training	Emergence of "penal scientists"
1913	Clinical criminology	Lombroso's thesis refuted; early psychiatric research	Focus on unitary causes such as physical disabilities and mental defects	Individual diagnosis emerging	Professionally trained clinicians
1929	Lethargy and confusion	American prison riots 1929–32. Exploitation of prisoners by contractors	Emotional and mental	Probation and parole used more widely	Politicians dominate
1936	Cultural therapy	Era of "New Penology." Expansion of Federal Bureau of Prisons	Multiple factors and their interdependence	Community prisons. "Classification" begins in prisons	Psychologists, sociologists and, psychiatrists
1950	Psychotherapy	Rise of progressive prisons, Adult Authority–Youth Authority	Personality frustration	Social education, counseling, and guidance	Career wardens and staff. Departments of correction
1956	Group and occupational therapy supplementing psychotherapy	Development of smaller rehabilitative units, such as forestry camps; emphasis on treatment for deviates	Social and psychic frustrations, multiple causation	Individual diagnosis and treatment	Professionally trained personnel. Departments of correction

Adapted from *New Horizons in Criminology* by Harry E. Barnes and Negley K. Teeters, Prentice Hall, Inc., ed. 1951. Original by Walter W. Argow.

years, and varies from state to state. In some cases, antiquated laws on statute books are no longer enforced, but remain as anachronistic reminders of a simpler society. See Blue-Sky Laws; Treason.

Causes of Crime. Many explanations are offered to account for the existence of crime, among them lack of education, inadequate recreational facilities, decline of religion, parental neglect, poverty, alcohol, incompetent or corrupt law-enforcement agencies, bad heredity, physical handicaps, mental deficiency, and mental disease. Since any one explanation falls short of providing a satisfactory answer, increasing importance has been given to the study of all factors as they interact in the individual case.

The oldest theory on criminal conduct is diabolical possession or instigation. Prevalent in primitive, Oriental, and medieval societies, the theory is no longer commonly held, although traces of it linger. In societies in which this theory was supported, in order to exorcise the demon, it was the practice to punish the person possessed or to banish or execute him. The prosecution of "witches" in early American history is an example of this practice. See Witchcraft, *Witch Hunts*.

The theory of the born criminal, destined to crime because of his physical make up, has been discredited, but still persists. Cesare Lombroso, an Italian anthropologist and physician, formulated the doctrine that the criminal could be detected by certain physical stigmata. (See Atavism; Lombroso, Cesare; Criminology, *Criminal Anthropology*.) In contrast, Dr. Charles Goring, an Englishman, studied a group of convicts and nonconvicts and concluded that criminals are not differentiated from the noncriminal population by physical characteristics. Modern criminologists, confirming the Goring findings, do not believe that criminals constitute a distinct type by birth, identifiable through physical anomalies. They hold that no person is foredoomed to a career of law violation because of his germ plasm. Heredity, in its interaction with other factors, both personal and environmental, may be the major factor in a criminal career just as it may be in a successful business or professional career; however, this is very different from saying that as a result of heredity, and regardless of other factors, an individual will engage in criminal behavior.

Physical defects and abnormalities such as blindness, baldness, deafness, obesity, disfiguring birthmarks, and glandular disturbances may be important factors in human behavior, but their action is indirect. Culture may designate obesity as a mark of distinction or attribute divine powers to the epileptic. Even when physical defects and abnormalities cause personality disturbances, the behavior of the person may not be defined by his culture as delinquent or criminal. Instead, his drive for security and recognition may carry him to prominence and honor among his fellows.

It must be emphasized that the mere presence of personality conflicts or the possession of certain personality traits does not necessarily result in criminal behavior. (See Criminology, *Criminal Psychology*.) The problem is far too complex to be solved in so simple a manner. Aggressiveness, shyness, frankness, disagreeableness, and conscientiousness may find expression in all kinds of behavior, which may be either criminal or noncriminal. Yet so highly emotional an experience as frustration may not produce even aggressiveness, but instead may be dissipated through mirth and jocularity.

The over-all incidence of mental disease and mental deficiency in criminals is unknown, but several other points have been clearly established. Neither mental disease nor mental deficiency inevitably causes crime. Some persons suffering from these conditions do come into conflict with the law, but many others do not. The great majority of law violators, like the great majority of law-abiding citizens, can be classified as normal.

Social and Environmental Factors. In their creative adjustment with the geographical environment and with one another, men develop rules and standards by which they regulate their behavior and facilitate the satisfaction of their needs in terms of a generally accepted set of values. Social change tends to disrupt social relationships and to inject conflicting values. Unless the community or society makes compensating adjustments, the influence of social rules declines; social disorganization eventually breaks through; and culture divergence and ensuing conflict, ineffective group controls, and divisive social processes operate as important factors in the rise of crime, delinquency, and other social problems. See Social Control; Culture; Criminology, *Criminal Sociology*.

Social disorganization manifests itself in various forms. It may be temporary and spectacular, as in sudden riot; dramatic and pervasive, as in a war; or chronic and ennervating, as in a slum area or during an economic depression. Regardless of the form it assumes, social disorganization touches all aspects of social life, transmitting its repercussions throughout the entire network of relationships that tend to bind a community or a society into a cohesive unit. The home and family, the church, the school, the neighborhood, the gang, recreational facilities, places of business and industry, law-enforcement agencies, and other social groups and social institutions interact in a functional relationship, and each not only reflects but also augments the social organization of which it is a part.

An examination of the causes of crime and delinquency indicates that there is no simple explanation for the existence of the problems. Human behavior, whether law-abiding or law-violating, is the result of the interaction of personal and environmental factors, and the nature of these elements and their varying combinations differ greatly from one case to another. Valuable insights into reality are often found in the formulation of new and apparently all-inclusive theories of criminal behavior, but a recognition of the complexity of causation firmly warns against the complete or uncritical acceptance of such theories.

Robert G. Caldwell

Crime Detection

The scientific investigation and detection of crime are an integral part of the police system. Relatively few arrests for serious crimes are made at the time the crime is committed. In the great majority of cases the guilty party must be sought. Crime detection experts utilize their knowledge toward establishing the nature of the crime, the method and means by which it was carried out and, in the identification of the criminal. Another important phase of their work is supplying evidence for the actual trial. The most frequently used

Dust and debris, vacuumed from clothing, is subjected to microanalysis. In many instances such study aids greatly in localizing areas in which a victim or suspect has been.

FBI, U.S. DEPT. OF JUSTICE

FBI, U.S. DEPT. OF JUSTICE

The identification of new fingerprints by comparing the prints on file in the FBI Identification Division is one of the important steps in the apprehension of criminals.

FBI, U.S. DEPT. OF JUSTICE

A laboratory technician checks suspect and tests bullets through a comparison microscope. Firearms identification evidence has received widespread approval in the courts.

source of information for locating the criminal is the stool pigeon.

In the United States the outstanding crime detection laboratory is that of the Federal Bureau of Investigation, established in 1932 (see FEDERAL BUREAU OF INVESTIGATION). Crime detection laboratories are also operated by most of the police departments in the large cities of the United States, and some states have laboratories to serve the crime detection needs of smaller cities and rural areas.

The large crime detection laboratories have facilities for developing and identifying fingerprints; for determining whether or not a certain bullet or shell was fired from a suspected gun; for comparing handwritten or typewritten documents in an effort to identify the writer or the machine; and for such other purposes as the identification of tool marks and the microscopic or chemical analysis and identification of minute particles such as dust, paint chips, or stains (see BLOODSTAINS). Many laboratories also have lie detectors or polygraphs.

Fingerprint Identification. A person's fingertips contain intricate papillary ridge formations that constitute a positive means of identification. The impressions or fingerprints made by the ridge formations of one person have never been found to be exactly like those made by another person.

A criminal who handles or touches objects such as paper, glassware, wood, metal or other smooth surfaces may leave a latent fingerprint that is often susceptible of development by means of powders or chemicals, making it visible for photographing. Such a print can be compared with the inked impressions of a suspect's fingertips and a determination made as to whether or not the print at the crime scene was made by the suspected individual. Prints can also be checked with FBI central files for other identifying data. See FINGERPRINTING.

Firearms Identification. The interior surface of every pistol and rifle barrel contains a distinctive set of markings, peculiar to each individual gun even though reamed out by the same rifling tool and in immediate sequence. The same is true of the breech faces and firing pins of every modern type of small arm. Because bullets and shells are of softer metal than that with which they come in contact upon firing, they take on the reverse impressions of the markings on the more substantial material. Each barrel, or breech face, or firing pin (or even extractor) leaves its characteristic markings upon the bullets or shells fired by that particular weapon. (See BALLISTICS.) With a comparison microscope, the minute markings on bullets found in the bodies of victims or shells found at the scene of a shooting can be examined and compared with test bullets or shells fired by suspected weapons, and a determination can be made as to whether the same weapon has been used in both instances.

The distance at which a gun has been fired can be determined from the nature and extent of the powder pattern on the body or clothing of the victim. To determine firing distance, shots are fired from the evidence gun at various distances from such objects as pieces of white cardboard or clothing. The powder or shot patterns thus obtained, which vary in size, are compared with the pattern left on the body or clothing of the victim. When the latter pattern coincides in size with a test pattern, the expert may then conclude that the distance at which the particular test pattern was obtained is the approximate distance from which the victim of the shooting had been fired upon.

Questioned Documents. No two people write so that there is a duplication of an appreciable number of individual characteristics. Moreover, it is extremely difficult to simulate intentionally another person's handwriting well enough to escape detection by a competent document examiner. The order in which writing is placed on a document can generally be determined, provided that ink strokes from two lines of writing intersect, or that the writing crosses folds or perforations in the paper. The expert may disclose evidence that a document could not possibly have been written at the purported time because the kind or brand of paper used was not manufactured until a later date. Many will forgeries have been detected by this means. See HANDWRITING; FORGERY.

Typewritten documents can be identified by experts because no two typewriters are identical even though manufactured by the same company, one immediately after the other. Some variations always appear, though they may be no more than space differences between letters. After an instrument has been used, a greater number of individual characteristics will appear; therefore, a comparison of two typewritten documents may reveal whether they were done on the same machine.

Visual and microscopic examinations of a document, supplemented in some instances with ultraviolet or oblique light, may reveal that an erasure

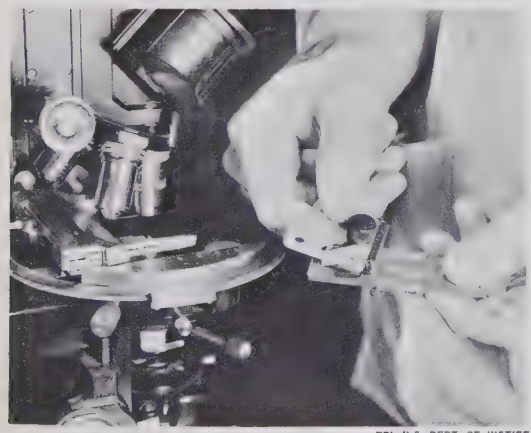
has been made. If ink writing has been removed by abrasion or ink eradicator, restoration can usually be effected by photographic or chemical processes. Even erased pencil writing or typing, as well as effaced stamp printing, can occasionally be deciphered. In many instances restoration or decipherment can be accomplished with writing that has been covered over or expunged, has become partially obliterated from soiling, or has faded because of age or water soaking. Writing on charred or burned documents frequently can be made legible.

Microanalysis and Comparative Micrography. Microscopic and microchemical examinations can be made of many types of materials, either to determine their nature and source or to establish the similarity or identity of two or more specimens. Among the materials examined microscopically are human and animal hairs; fibers of cloth, wood, paper, and cordage; stains on clothing; fragments of plant and animal tissues; metal particles; shoe dirt; and fingernail scrapings. Comparisons of fragments recovered at crime scenes with pieces of the same type of material found in the possession of a suspect may establish whether the distinct parts originally constituted a single piece. In some cases, the irregular severed ends or edges can be fitted together or matched. In others in which the original edges have been altered, comparison can sometimes be made on the basis of surface markings, structural patterns, or other characteristics in both specimens.

Various tools such as pliers, bolt cutters, pry bars, planes, and knives frequently leave distinctive markings upon the articles on which they are used. Identification of the tool is made upon the basis of markings left on the object by minute or microscopic imperfections on the surface of the tool itself.

Microscopic, spectrographic, chemical, and physical tests can determine the component characteristics of a metal specimen, a process that may indicate its source and possible previous use. More positive proof of the origin of metallic fragments recovered at crime scenes is established by comparing the irregular broken edges of these fragments with damaged pieces of metal found in the possession of the suspect. In hit-and-run automobile accident cases in which fragments such as pieces of radiator ornaments, headlights, or bumpers are recovered, examination of this type is used.

The Lie Detector and Truth Serum. Instruments recording various physiological changes such as blood pressure, pulse, and respiration have been employed in an effort to determine whether a person suspected of law violation is lying or telling the truth. In their recordings, the polygraphs or lie detectors produce a chart by which a fairly reliable deception diagnosis can be made by a trained and competent examiner. See Lie Detector.



FBI, U.S. DEPT. OF JUSTICE

Hair fibers are cross-sectioned by the use of a microtome preparatory to microscopic study for identification at the FBI Technical Laboratory, U.S. Department of Justice.

Certain drugs, including scopolamine, sodium amytal, and thiopental sodium, have been utilized to induce a seminarcotic condition for so-called truth serum tests. In some cases subjects of the tests have disclosed significant information when interrogated, but the accuracy and practical value of the truth serum procedure remain a matter for more experimentation. The lie detector technique is considered to be more dependable and accurate.

Science cannot replace the common sense and experience of an able police officer, but the scientist and police laboratory are indispensable to the efficient operation of police departments. Scientific methods of crime detection and scientific evidence are essential not only for the greater efficiency they give a police department in apprehending and convicting the guilty, but also in the protection of the innocent who are suspected or accused of a criminal offense.

Fred E. Inbau

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CRIMEA, an administrative region of the Ukrainian Soviet Socialist Republic, comprising a peninsula in the Black Sea separated from the N Caucasus by the Kerch Straits and connected to the Ukrainian mainland by the Isthmus of Perekop; area 9952 sq. miles; pop. about 1.2 million. The inhabitants of the Crimea are primarily Russians and Ukrainians. The chief cities include Simferopol, the capital, Sevastopol, the great naval base, Kerch, Feodosiya, Yevpatoriya, and Yalta, the largest health resort on the southern coast.

Physical Factors. The region is divided into four natural areas: the steppe plains of the north, the Kerch Isthmus, the mountain section, and the narrow plain in the south. The steppe plains, which occupy more than three-quarters of the total area of the region, are a continuation of the Ukrainian steppe. The mountains are mostly of limestone formation. Their summits are covered with Alpine plants and steppe grasses. The narrow coastal plain of the south varies in width from a mile to more than 6 miles. Once the playground of the old Russian nobility and long known as the Russian Riviera, this area is dotted with recreational centers and health resorts operated for privileged Soviet officials and workers. The climate is of the Mediterranean type with mild winters and sunny summers. Lush vegetation covers the land, which slopes gently to the sea.

Economic Factors. Wheat, barley, and tobacco are grown on the steppe plains, where there is also some cotton and fruit cultivation. Forestry and sheep raising are important in the mountains and horticulture and tobacco and grape growing in the valleys. The Kerch area is a source of oil and natural gas and has deposits of iron ore, gypsum, and limestone. Other industries of the Crimea include the mining of phosphorus, coal, and salt, chemical manufacturing, commercial fishing, and the manufacture of machines and building materials.

Under the sixth Five-Year Plan (1956–60) the Soviets began to construct the North Crimean Canal, from Kakhovka on the Dnepr (Dnieper) through the Perekop Peninsula to the end of the Kerch Peninsula in the southeast. There is railroad ferry service between Kerch and the Caucasus shore.

EWING GALLOWAY

A highway winds through the Crimean Mountains of southern Ukraine. South of the mountains, along a narrow shelf fronting on the Black Sea, the climate is semitropical.

SOVFOTO

Proudly overlooking the harbor at Sevastopol from Malakhov Hill is this monument dedicated to the Soviet airmen who in World War II helped free Crimea from the Germans.

SOVFOTO

Facing the sea at Miskhor on the southern coast of Crimea is this vast sanatorium and estate where some Soviet timber workers spend vacations and receive treatment each month.

INTERNATIONAL NEWS PHOTOS

In this palace was held the 1945 Yalta Conference, in which Roosevelt, Churchill, and Stalin met privately to make the agreement that was later subjected to bitter attack.

Vacationists enjoy the sunshine on the seaside promenade at Yalta on the Russian Riviera. Mild winters and cool summers characterize the climate south of the mountains.

EWING GALLOWAY

History. Crimea was known to the ancients as Chersonesus Taurica and as early as the sixth century B.C. was the seat of flourishing colonies of Ionian and other Greeks. From the fifth to the end of the second century B.C., the area formed the kingdom of Bosporus under an independent dynasty, passing in 115 B.C. to Mithridates and in 63 B.C. to his son Pharnaces. Afterward it fell successively to the Goths, A.D. 250; Huns, 376; Khazars, eighth century; Byzantine Greeks, 1016; Kipchaks, 1050; the Tatar tribes from Central Asia, 1237. The Genoese established themselves on the coast in the thirteenth century and developed a flourishing trade centering at Kaffa (Feodosiya). They were expelled by the Turkish sovereign Mohammed II in 1475, and the whole peninsula was made an Ottoman dependency under a native Tatar ruler or khan. In 1783 Catherine II annexed the Crimea to the Russian Empire. In 1854–56 the peninsula's southern shore was the scene of the Crimean War between Russia and the Western allies and Turkey (see CRIMEAN WAR). In 1918 during the last phase of World War I, the Crimea was nominally an independent state under a local Tatar government although occupied by the Imperial German troops. Following a civil war between the Russian Reds and Whites, the Crimea became Soviet territory, November 1920, and was later made an autonomous republic although actually ruled by Moscow.

During World War II, Nazi troops cut off the Crimea from the mainland in August 1941 and captured Simferopol, the capital, in November. The besieged Kerch held out until May 23, 1942, when its Soviet defenders finally surrendered. Sevastopol fell to the Germans on July 2, after a 245-day siege. Most of the Crimean Tatars welcomed the Germans as "liberators" from the Soviet oppression, and some Tatar units joined the German army in the anti-Soviet combat. However, soon Nazi atrocities proved to be as bad as those of the Communists. In November 1943 Soviet forces landed at Kerch, re-occupying part of the peninsula, and during April-May 1944 they recaptured the rest of the Crimea. In February 1945 at Yalta occurred the historic conference of President Roosevelt, of the United States, Premier Churchill of Great Britain, and Dictator Stalin of the U.S.S.R. See YALTA CONFERENCE.

To punish the Crimean population for its anti-Soviet attitude, the Moscow government abolished the Crimean Autonomous Republic in February 1944. Soon afterward the Tatar population was exiled to Central Asia and Siberia. The deportees also included some Russian and Ukrainian inhabitants of the Crimea. They were replaced by Russians and Ukrainians brought in by the Soviets. On Feb. 19, 1954, the Moscow government transferred the Crimea from the Russian Soviet Federated Socialist Republic to the Ukrainian Soviet Socialist Republic. See UKRAINIAN SOVIET SOCIALIST REPUBLIC; SEVASTOPOL.

ALBERT PARRY

CRIMEA CONFERENCE. See YALTA DECLARATION.

CRIMEAN WAR, fought chiefly in the Crimea from 1853 to 1856 between Russia on the one side and Turkey, England, France, and Sardinia on the other. The conflict had its origins in the weakness of the Ottoman Empire and in Russian desires for a position on the Bosporus. (See EASTERN QUESTION.) The immediate issue arose over the custody and special privileges of the Christian monks at the holy places in Palestine. Napoleon III of France supported the demands of the representatives of the Latin church, and Czar Nicholas I of Russia upheld the Greek monks. The claims of the czar would further have made him protector of the millions of Orthodox Christians within the Ottoman Empire and given him the opportunity to intervene in the internal affairs of the empire. The sultan refused to accept this claim, and Russian troops were sent to the principalities of Moldavia and Wallachia, then under Turkish suzerainty but with special Russian rights of protection. Efforts by the western powers to mediate failed, and in October 1853 the Ottoman Empire declared war on Russia. England and France declared war on Russia, March 28, 1854, and in January 1855 Sardinia joined the alliance and sent a contingent to the Crimea.

British and French fleets sent to the Baltic Sea and the Gulf of Finland forced tne Russian fleet to retire behind the forts of Kronstadt and Sveaborg. Bomarsund was destroyed in 1854 and Sveaborg partly destroyed the following year, but Kronstadt and the Russian fleet were not taken. The major portion of the war, however, was almost exclusively military in character and fought in the Black Sea area.

Meanwhile Russian forces had advanced on the Danube in late 1853 and early 1854. The allied forces were landed at Varna, Bulgaria, to assist the Turks, but the Turkish defense of Silistria and Austrian diplomatic action made further effort in that area unnecessary. The allies decided to carry the war to the Crimea, defended by the great fortifications of Sevastopol. Allied forces under the British general Lord Raglan and the French Marshal St. Arnaud landed on the Crimea in September 1854. On September 20 they attacked the strong Russian positions on the River Alma and took them. Instead of attacking Sevastopol directly from the north, the allied forces circled and took up position near Balaklava to the south of the city.

On Oct. 25, 1854, was fought the battle of Balaklava, a cavalry engagement made famous by Tennyson's poem. (See CHARGE OF THE LIGHT BRIGADE.) Lord Raglan's order was not clear, and was so interpreted as to compel a charge by the light brigade into heavy fire from the Russian field batteries. The brigade reached the guns and attacked the artillerymen, but failed to dislodge them and lost two-thirds of its men.

The battle of Inkerman, fought on November 5, was largely a hand-to-hand encounter between British troops and a much larger Russian force. Fought in a fog, it resulted in an allied victory. Sevastopol held out, however, and the British and French troops were forced to undertake a siege from temporary winter quarters under difficult conditions and with a disastrous lack of preparations. Famine and disease swept the British army, costing several times as many casualties as Russian arms. The appalling inadequacy of hospital conditions increased the dangers. Florence Nightingale contributed greatly to the improvement of nursing in the hospitals and to a more efficient supply system, and thus established her great reputation. See NIGHTINGALE, FLORENCE.

After three days of bombardment, the French stormed and carried the Malakoff fort, key to the Sevastopol fortifications, on Sept. 8, 1855. The fortifications, which had held out almost a year, were evacuated the night of September 8–9, and the major actions of the war were concluded, except for the capture of Kars in the Caucasus by the Russians.

Efforts at mediation had been made at Vienna in the spring of 1855, but failed. A truce was arranged in January 1856, and peace negotiations at Paris concluded with a treaty signed March 30. By its terms Russia lost a portion of Bessarabia to Moldavia and gave up its claim to a protectorate over Moldavia and Wallachia; the powers guaranteed the Ottoman Empire; the Danube River was declared open to navigation and the Black Sea was neutralized and opened to international commerce.

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CRIMINAL CONSPIRACY. See CONSPIRACY.

CRIMINAL COURT. See COURT.

CRIMINAL LAW. This branch of the law deals, on the basis of moral considerations, with public wrongs (crimes) as distinguished from private wrongs (delicts or torts).

Human Crimes and Property Crimes. The two major classifications of criminal offenses are human crimes, or crimes of violence to persons, and property crimes. The most common crimes against the person include voluntary manslaughter (sometimes known as murder in the second degree), mayhem, and assaults with certain intents; the most common crimes against property include burglary, grand larceny, and generally robbery. These six typical crimes illustrate in the mundane law what is enjoined by the Commandments "Thou shalt not kill" and "Thou shalt not steal."

There is a conflict among jurisdictions as to whether robbery is a human crime or a property crime. The view supported by the majority is that robbery is a property crime because the attraction, or motivation, is the property rather than the person. The person is affected only as a necessary incident to being forcibly deprived of his property. The motive in the case of robbery is illegal gain, the unlawful acquisition of property, not the killing of a person or the infliction of injury upon him. Although neither mayhem nor assaults with certain intents involves the killing of a human being, nevertheless both these crimes come closer to homicide than any other nonhomicidal crimes against the person. Assaults with certain intents include assaults with intent to murder, maim, or ravish. Sixteen states—Alabama, Colorado, Illinois, Indiana, Kansas, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Mexico, New York, Oregon, Washington, and Wyoming—specify assaults with certain intents as a generic statutory crime. Five states—Arkansas, Georgia, Maryland, North Carolina, and Texas—have detailed mayhem statutes. These statutes, particularly the Georgia statute, set forth different punishments for the maiming of different parts, limbs, organs, and members of the body. In this sense these statutes are analogous to the recovery provisions of casualty insurance policies.

Comparison of Crimes and Torts. The nature of a crime (a public wrong) may be understood by comparison with a tort (a private wrong). A crime and a tort each consists of an unlawful act; many times the same act will constitute both wrongs. However, a crime and a tort have different plaintiffs; for a crime the state is the plaintiff whereas for a tort a person is the plaintiff. One may consent to the infliction of a delict but not to a penal offense. One may accept settlement for injury received as the result of a tort that does not also amount to a felony but one may not accept a settlement for injury received as the result of a crime. Intent plays a role in criminal law similar to the role assigned to negligence in tort law. In a criminal action contributory responsibility on the part of the injured, if disproportionate to the

degree of force exerted against him, will not discharge the defendant from liability, as would be the case in a tort action, but will only mitigate the charge or the punishment.

There is no time limitation on tortious proximity other than the statutes of limitation; but in criminal proximity there is also the year and a day rule pertaining to homicide, meaning that the victim must die within one year and one day in order for homicide to have been committed. In order to have the force of law, every crime must be mentioned by name in a statute. There is usually a separate statute for each crime. The statutes ordinarily define the crimes; however, if this is not done, the common law definitions prevail. But one or two general statutes to the effect that no person shall suffer a wrong without being afforded a remedy by the law can validate all common law torts even though no specific torts are referred to by name.

The injured person may condone a tort but not a crime. However, the state may partially condone a penal offense in the sense that it may elect to prosecute for a lesser degree of the offense. Unlike the delict defense of condonation, the divorce defense of condonation is conditional upon the future good behavior of the erring spouse, similar to the criminal concept of probation. The imposition of a fine in a criminal case is analogous to the assessing of punitive damages in a delict action. The element of malice seems to be the factor which enables society to reach a proportionate degree of guilt and punishment between torts and crimes. Just as the presence of malice authorizes the awarding of punitive damages in a tort action so too does the presence of malice justify indictment for the type of homicide carrying the severest punishment in criminal prosecution.

Immediate and Ulterior Intents. As John Salmond pointed out in his work *Jurisprudence*, every crime has two intents, an immediate intent and an ulterior intent or motive. The crime of Jean Valjean in Victor Hugo's *Les Miserables* illustrates both intents with regard to theft. Valjean's immediate intent was to take the loaf of bread. His ulterior intent or motive was to placate the hunger of his loved ones who were starving. The ulterior intent or motive may be good or bad. In Valjean's case it was good. But whether the ulterior intent or motive is good or bad makes no difference to the criminal law. Hence Valjean was convicted, and so would be any twentieth century American acting under similar circumstances.

Presumptions of Innocence and Incapacity. In the criminal law the law casts a presumption of innocence in favor of the defendant. This presumption then casts a burden upon the plaintiff (the state) to prove the guilt of the defendant beyond a reasonable doubt or (if the evidence against him is entirely circumstantial) to a moral certainty. If this is thought by the jury to have been done, then the presumption of innocence is overcome. Proof beyond a reasonable doubt is the heaviest burden of proof known to the law. The origin of the doctrine that a defendant accused of a crime cannot be convicted unless his guilt is proved beyond reasonable doubt lies in the canonical law of the Roman Catholic church. The church requires the same degree of proof in order to prove heroic virtues or martyrdom and miracles to the Sacred Congregation of Rites preliminary to beatification.

The law casts a presumption, which can be rebutted, of incapacity to commit a delict or a crime, in favor of minors between the ages of 10 and 14. If a minor between these ages is accused of crime, then the law casts two presumptions in the minor defendant's favor—that of innocence and that of incapacity. The presumption of incapacity casts a burden on the state to prove the capacity of the minor defendant by a preponderance of evidence.

Representative Punishments. For the three human crimes selected here as representative, the average minimum punishment is two years and the average maximum punishment is 13 years. For the three representative property crimes the average minimum punishment is three years and the average maximum punishment is 15 years.

For voluntary manslaughter the average minimum punishment is two years and the average maximum punishment is 14 years. For mayhem the average minimum punishment is one year and the average maximum punishment is 13 years, with only Georgia providing the death penalty in certain instances. For assaults with certain intents the average minimum punishment is two years and the average maximum punishment is 13 years, with Oregon giving its courts the power to impose life imprisonment and Missouri and North Carolina giving their courts the power to impose any number of years (above a two-year minimum in the case of Missouri).

For burglary the average minimum punishment is three years and the average maximum punishment is 15 years, with Alabama and Virginia giving their courts the power to impose the death penalty; Illinois, North Carolina, Ohio, Rhode Island, and South Carolina giving their courts the power to provide life imprisonment; and California and Maine giving their courts the power to impose any number of years (above a five-year minimum in the case of California).

For robbery the average minimum punishment is five years and the average maximum punishment is 21 years; with Alabama, Georgia, Texas, and Virginia giving their courts the power to provide the death penalty; Colorado, Florida, Idaho, Illinois, Massachusetts, Michigan, Oregon, Rhode Island, and Utah giving their courts the power to provide life imprisonment; and Arizona, California, Maine, Missouri, Montana, North Dakota, Washington, West Virginia, and Wyoming giving their courts the power to impose any number of years (above a 10-year minimum in West Virginia, a five-year minimum in Arizona, California, Missouri, and Washington and a one-year minimum in Montana and North Dakota).

For grand larceny the average minimum punishment is one year and the average maximum punishment is nine years. The arbitrary amounts of money involved, varying widely from state to state, which divide the felony grand larceny from the misdemeanor petit larceny are low and the terms of years specified for grand larceny are proportionately high. For example, in Virginia a court has the power to sentence a man to 10 years for a five-dollar theft. North Carolina, Pennsylvania, and Rhode Island abolished the distinction between grand and petit larceny, but North Carolina made all larcenies the equivalent of petit larceny except "in cases of much aggravation, or of hardened offenders."

A number of states give their courts much power in so far as prescribing the length of terms of imprisonment to be imposed for property crimes is concerned. In Maine the length of terms for burglary and robbery is wholly discretionary with the courts. In Illinois the courts have been given a statutory range of one year to life for punishing burglary and robbery; for robbery, in Colorado the range is two years to life imprisonment and in Idaho the range is five years to life.

Certain states have established a minimum term but no maximum term, giving their courts complete discretion over and above the minimum terms provided, as for example Oklahoma with a minimum of 10 years for robbery, South Dakota with a minimum of 10 years for burglary, Arizona and Nevada each with a minimum of five years for robbery, California with a minimum of five years for burglary and robbery, and Montana and North Dakota each with a minimum of one year for robbery.

Certain states stipulate both a minimum number of years and a maximum number of years, but make the two extremes far apart, thereby giving their

courts much leeway. Nebraska prescribes a minimum of three years and a maximum of 50 years for robbery, thus giving her courts a range of 47 years. Minnesota prescribes a minimum of five years and a maximum of 30 years for robbery, thus giving her courts a range of 27 years. North Carolina provides a minimum of five years and a maximum of 30 years for robbery, thus giving her courts a range of 25 years. Delaware provides a minimum of three years and a maximum of 25 years for robbery, thus giving her courts a range of 22 years. Arkansas stipulates a minimum of one year and a maximum of 21 years for grand theft, thus giving her courts a range of 20 years. New York stipulates a minimum of 10 years and a maximum of 30 years for robbery, thus giving her courts a range of 20 years.

Certain states have established long minimum terms. Alabama, Indiana, and Kansas each has a minimum of 10 years for burglary and robbery; Oklahoma, New York, Ohio, and West Virginia each has a minimum of 10 years for robbery; South Dakota has a minimum of 10 years for burglary; and Mississippi and Oklahoma each has a minimum of seven years for burglary.

The punishment of death which is usually accorded a murderer has been abolished in a number of states, not because of a wish to lessen the punishment for murder but because of the desire to abolish capital punishment (accorded treason as well as murder).

H. N. M.

CRIMINOLOGY in a narrow sense is the scientific study of crime and criminals, but in the broadest sense it contains the entire body of knowledge concerning law violation and law violators and the efforts of society to repress them.

Criminology embraces investigation of the nature of criminal law and its administration and the conditions under which it develops; analysis of the causation of crime and the personalities of criminals; and control of crime and the rehabilitation of offenders. Other areas that may be included in criminology are criminal jurisprudence, or making and interpreting laws; criminalistics, or scientific detection and apprehension of the criminal; court procedure; and the gathering and interpretation of statistics relating to law violations and offenders. Penology, or corrections, as an area of criminology, is concerned with the operation of prisons and correctional institutions and with the rehabilitation of offenders. The program of penology has evolved from repressive custody, physical punishment, and hard labor into the era of confinement with humane treatment and prison programs designed to re-educate the individual prisoner for his re-entry into the outside world. See Prison, Modern Concepts in Penology.

In its over-all analysis of crime and criminals, criminology borrows from other scientific disciplines including anthropology, psychology, medicine, sociology, and geography. The development of the social sciences and the advances made in biology and medicine, particularly in psychiatry, have assembled for the scientific study of crime an impressive body of knowledge that aids in analyzing and predicting antisocial behavior. Emphasis in criminology has shifted from the belief in punishment for a specific crime to punishment of a specific individual who has committed a crime. Modern criminologists believe punitive measures should be directed at the criminal himself, taking into consideration in the disposition of his case his background, potentialities, habits, and modes of social thinking.

Negley K. Teeters

Criminal Anthropology

Criminal anthropology is the branch of the scientific study of man that is concerned with the possible relation of physical characteristics to criminal behavior. The assumption that law violation has a morphological or physical basis is a carry-over from the phrenology or craniology of Franz Gall and Johann Spurzheim, who studied the criminal in the late sixteenth and early seventeenth centuries. Character and personality traits, according to the phrenologists, were centered in certain areas of the brain. External signs of the traits were observable by "bumps" on the skull, and some prisons of that day set up phrenological charts by which inmates were analyzed. See Phrenology; Gall, Franz Joseph.

Physical Traits. Various other men soon stated there were definite morphological syndromes, or groups of physical traits, that pointed to criminality. The most famous of them was Cesare Lombroso, an Italian physician (1836–1909), who asserted that the criminal was a born type, a degenerate form of human being both morally and biologically, whose physical make-up was atavistic, or a throwback to an earlier biological stage of man. (See Atavism.) The physical characteristics that set the criminal type apart from the noncriminal type included, according to Lombroso, large, outstanding ears, massive eyebrow ridges housing large frontal sinuses, voluminous arches of bone that extended along the front side of the skull beneath the eye sockets, sparse and patchy beards, square and projecting chins, thin upper lips, and a "ferocious look." In addition Lombroso insisted there were definite types of persons associated with habitual forms of criminal behavior. See Lombroso, Cesare.

Sir Francis Galton of England noted "the degraded aspect" of English convicts from prison photographs. Klaatsch of Germany averred that men with "social defects," or those who committed crimes, had brains like Neanderthal man in form and development (see Anthropology, *Neanderthal Man*). Two Australians, Berry and Buchner, found that a sample selection of the brains of executed criminals had a capacity, or size, lower than average. In 1899, Ales Hrdlicka declared that in a group of 1000 criminals, 77 who were classified as "vicious" were "recognizably anthropometrically different" from the entire group; that is, the 77 had measurable physical differences distinguishing them from the others. Hrdlicka added, however, that there was no single sign or combination of signs that would point out an individual as potentially criminal before he violated the law.

The majority of these observations were limited to the nineteenth century and gave way in 1913 to the first scientific anthropometric study of criminals, conducted in England by Dr. Charles Goring. On the basis of his consideration of 3000 criminals, Goring concluded that there were no physical stigmata of crime; that there was no anthropological criminal type; and that lawbreakers were not different in particular physical characteristics from either the noncriminal population or from one another. See Body Type, *Practical Consequences;* Anthropometry.

Hooton Studies. Earnest A. Hooton of Harvard University in 1939 reopened the whole problem of biological causation of crime in his comparative study of 13,873 male prisoners in American penal institutions and 3023 noncriminals, including firemen in Nashville, patrons of a Massachusetts bathing beach, and a few outpatients at a hospital. Hooton advanced the general theory that criminality was associated with, or due to "biological inferiority." He denied there was a distinct criminal type; however, he affirmed his belief that certain groups of offenders were characterized by distinct patterns of physical traits. Among Hooton's findings was the conclusion that crime is the result of a complex process of biological and social forces by which mentally and physically inferior individuals are selected for criminality. (See Hooton, Earnest Albert.) A year after Hooton's study was released, Professor William H. Sheldon and his associates, also of Harvard, published *Varieties of Human Physique*, which attempted to correlate certain types of body build with certain personality types. A later work from Sheldon, *Varieties of Delinquent Youth*, sought to establish the thesis that

behavior is a function of structure and can therefore be predicted on the basis of careful physical measurements.

On the basis of later evidence, however, the majority of American criminologists hold that no one approach to a theory of crime causation can be considered apart from other approaches. If it is true that biological makeup is a factor, it is an indirect factor only. Studies have discredited theories that crime tendencies are inherited through the germ plasm; that the criminal is an atavistic creature; that the man who breaks the law is differentiated from other men by physical stigmata; or that individuals possessing certain physical characteristics will ultimately pursue careers of crime. The raw material carried by the germ plasm and transmitted through heredity is molded and modified by social experience, and to the extent that heredity varies among men, it contributes to individual differences. It is not the individual physical differences among men, but how the differences interact with each man's personal and environmental factors, that decides whether he will break the law or abide by the law. B. H. M.

Criminal Psychology

Criminal psychology is the scientific study of the psychological factors in operation in the criminal act and the criminal career. It also points the way toward crime prevention and presents opportunity, through understanding of reasons for crime, for treatment of the offender.

Various theories have been proposed to explain why some men offend, transgress, ignore, or otherwise disregard the laws and rules that have been enacted largely for their safety and protection. It has been suggested that criminals behave as they do from sheer perversity; because they are under the influence of evil spirits; because they are so physically constituted that they are predestined to criminality; or because the gain resulting from the commission of crime is stronger than the punishment it might bring. On rigorous examination of these reasons, however, criminal psychologists have concluded that they lack validity and offer no fundamental understanding of the prevalence of crime in all times, all places, and among all kinds of people. The theories do not explain why men risk, in breaking laws, the censorship of their fellowmen and even severe punishment ranging from imprisonment to the sacrifice of their own lives.

The Psychoanalytical Approach. The modern psychoanalytical viewpoint is that the criminal is an individual whose personality functioning is distorted and out of balance, so that he is unable to perform in the integrated manner required for harmonious social living. His activities can be regarded as the outward manifestation of this distortion, expressed in a symbolical language of action that the modern criminologist, aided by insight obtained through psychological study and experience, can read.

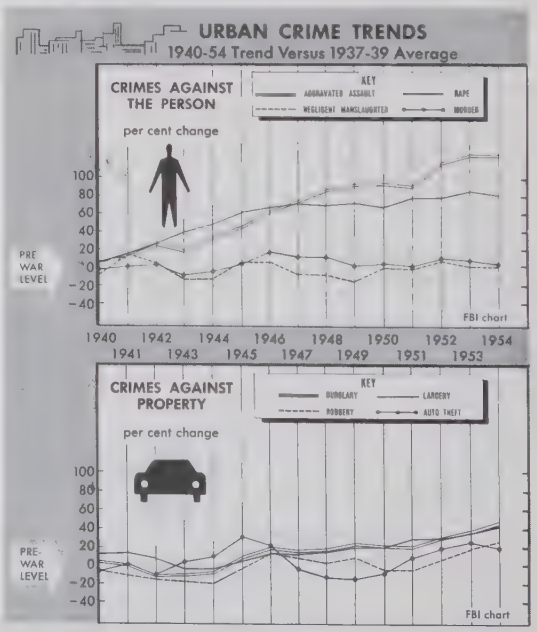
An understanding of why men commit crimes, derived for the most part from psychoanalysis, requires a close grasp of the complex workings of the human mind, and particularly of the unconscious, which is not immediately accessible. (See Psychoanalysis.) Impulses and urges arise from this remote, all-important area. The relationship of unconscious and conscious, the latter providing overt control, is extremely complex and involves many features of personality genesis and structure. In brief, upon the interaction of the two parts and upon the ability of the aware conscious to control and satisfy the demands of the unconscious depend whether a person will behave criminally or in accordance with law.

The impulses that arise from the unconscious, are of such commanding force that they can be denied only at great expense and suffering to the personality, and no written law or promised punishment can prevail in certain persons or in all persons under certain conditions. Broadly speaking, the unconscious is composed of childhood memories; of lingering, unfulfilled needs and desires abandoned with growing to maturity; of repressed feelings, ideas, and wants the individual has been forced to renounce; of a mass of urges peculiar to *homo sapiens;* and, some psychologists believe, of much of the accumulated heritage of common experience. See Jung, Carl Gustav; Freud, Sigmund.

In contrast with the unconscious is the broad area of the conscious, which provides control over the unconscious. Consciousness is deliberate, planned, reason-directed behavior and thought that governs conduct in respect to external conditions and is concerned for the safety and social welfare of the individual. Most law seeks to bolster and support personality elements that co-operate with the reasoning consciousness. As a rule, the law simply phrases in a negative fashion the normal contents of the unconscious. By and large, the law is actually an injunctional statement of those activities of which every person is capable, but which he is prevented from doing by the presence of a controlling segment of mind, the conscious.

Break-through of the Unconscious. On occasion the break-through of the unconscious into behavior, an event that sometimes results in criminal behavior, is due indirectly to weakened biological factors that normally co-operate with the restraining conscious part of the individual personality. Certain forms of feeblemindedness, faulty germ plasm, prenatal accidents, physical disabilities, and, in many instances, faulty training of the child and unhealthy mental environmental factors and early relationships with parents and other significant people produce a weakness of the containing areas of personality. Sometimes life stresses and strains, conflicts and tensions, perplexities, problems, and illnesses debilitate the portions of the personality that function in the service of reason, restraint, and socialization.

The formula of the interplay between the unconscious and conscious of the individual mind has become one of the cornerstones of modern criminology. Proponents hold that this interplay explains not only why certain individuals become criminals, but also why the great majority of persons never offend the law. The treatment of the individual criminal under this formula differs only in degree, not in kind, from



OFFENSES KNOWN TO THE POLICE
363 Cities—Total Population 47,586,584

the treatment offered for any other variety of malfunction or dysfunction of the personality. See PSYCHOTHERAPY. ROBERT M. LINDNER

CRIMINAL SOCIOLOGY

Criminal sociology emphasizes the study of phenomena operating in the social environment leading toward the understanding of criminal behavior. It analyzes such social factors as housing, group activity, customs, population, and the family.

At least a few of the roots of the modern sociological approach to crime are found in writings of European scholars during the early part of the nineteenth century. Gabriel Tarde (1843–1904) in France advanced the theory that society can be explained in terms of the influence of mind on mind through the force of imitation, and in this manner, he suggested, criminality is spread from person to person. Crime was held to be "a natural and inevitable incident of social evolution" by Émile Durkheim(1858–1917), also of France, while William A. Bonger (1876–1940), a Dutch criminologist whose hypothesis was based on the writings of Karl Marx, attributed crime to the "weaknesses of capitalism." Although these writings vastly oversimplified reasons for criminal behavior, by delineating the social factors involved they helped to counteract the strong emphasis placed on biological traits during the same period. In the United States the greatest development in the sociological approach to crime causation came after World War I.

Differential Association. Among the better known theories propounded by U.S. sociologists to explain law-breaking behavior is that of differential association. Edwin H. Sutherland, who was also responsible for the concept of the "white collar criminal," originally presented the theory in his book *Principles of Criminology* in 1939. A restatement of differential association appeared in 1947 and can be summarized as follows: criminal behavior is learned in interaction with other individuals, particularly in intimate association; all the mechanisms involved in any other learning are also involved in learning criminal behavior; criminal behavior cannot be explained in terms of values and general needs such as social status and happiness, since behavior that is noncriminal is an expression of the same values and needs; and a person becomes delinquent because, in his association with others, he learns more definitions favorable than unfavorable to law violation. Thus differential association is the cause of criminal behavior. Sutherland added that differential associations may vary in duration, priority, frequency, and intensity.

Other Social Approaches. Some criminologists have emphasized specific cultural characteristics as the major causes of criminality. The criminal himself is referred to by a number of writers as the "socially maladjusted individual." Donald R. Taft held that "crime grows out of a materialistically minded society with its constant striving for prestige and wealth"; at the same time Taft acknowledged that his theory was based chiefly upon conditions in the United States and admitted that psychological and biological factors should also be taken into account. Thorsten Sellin, in *Culture Conflict and Crime*, pointed out the necessity of looking for what he described as "conduct norms," and cataloguing them so that society could understand their full meaning when they were applied to individual behavior. Conduct norms are the rules of the group or society that prohibit or enjoin persons from acting in certain ways under certain circumstances.

Other American sociologists, among them Walter H. Reckless, Ruth Shonle Cavan, and Marshall B. Clinard, attribute prime importance to culture conflict, but do not hold that it alone explains all criminal behavior. They believe that personality elements and the differential response patterns of individuals must also be taken into consideration.

The Ecology of Crime. The ecological approach in sociology has been utilized by many investigators, among whom probably the most widely known is Clifford Shaw, who in *Delinquency Areas*, published in 1929, demonstrated the influence of the transitional, or interstitial zone upon delinquent behavior. The transitional zone contains the highest rate of delinquency and is located immediately adjacent to the center of the city, which embodies the business and financial districts. Characterized by cheap rents, deteriorated property, gangs, undesirable influences, heterogeneous, or mixed, cultural and racial groups, and absence of social controls, the transitional zone is an area of social disorganization tending to produce disorganized personalities and delinquent careers. See JUVENILE DELINQUENCY.

A Sociological Viewpoint. The majority of sociologists seek to explain criminal behavior as a product of definitions of situations acquired in life experience. Although most of them lean heavily on the social factors, they tend on the whole to reach out into other behavioral sciences to study other forces involved for an over-all understanding. It has been pointed out that criminal behavior is human behavior, and any explanation of the former is nothing less than an examination of the latter. Thus, any theory of criminal behavior must include an examination of the biological and psychological elements that influence man's receptivity to social influences and his adaptation to social situations. See SOCIAL CONTROL; SOCIOLOGY; SOCIAL INSTITUTIONS. B. H. M.

CRIMINAL STATISTICS

Criminal statistics is the compilation of numerical data referring to the crimes committed, the individuals involved in lawbreaking, and the methods and institutions utilized for punishment and rehabilitation of convicted offenders. An efficient and highly coordinated system of criminal statistics is necessary in order to cope with the problem of crime; however, no method has yet been devised that has proved adequate to the needs of a society.

Historical Beginnings. During the early part of the nineteenth century, the Belgian mathematician Adolphe Quételet (1796–1874), often referred to as "the father of statistics," formulated a mathematical theory of human personality characteristics. His work in census taking, combined with studies of the theory of probability, furthered the establishment of statistics as a scientific method. Quételet's studies of social phenomena led to the recognition of criminality as a social fact and to the first application of statistics in the analysis of crime and criminals. (See QUÉTELET, LAMBERT ADOLPHE JACQUES.) In France, the first statistics on crime on a national basis appeared in 1829; in England, figures have been published each year since 1857. In the United States statistics on criminal prosecution and treatment were published in New York in 1829 and Massachusetts in 1832. National crime statistics began with figures concerning prisoners drawn from the federal census of 1850. The data outlined commitments of convicted criminals and was published as *Prisoners in State and Federal Prisons and Reformatories*.

Since 1926 the Children's Bureau of the federal government has gathered material regarding juvenile delinquency from juvenile courts, and in 1927 pioneer work in collecting national crime figures was undertaken by the International Association of the Chiefs of Police. By 1930 the Federal Bureau of Investigation had accepted the responsibility of collecting data on crimes throughout the country, with the voluntary co-operation of police agencies. The FBI *Uniform Crime Reports*, issued semiannually, contain records of crimes known and reported to the police; offenses cleared by arrest; individuals held for prosecution, released, or found guilty; and the number of offenses in various crime categories. See FEDERAL BUREAU OF INVESTIGATION, *Functions*.

In 1950 the Federal Bureau of Prisons took over the earlier work of the Census Bureau. Annually the publication *National Prisoner Statistics* reports trends in prison population, the number of prisoners received and discharged, types of offenses and length of sentence imposed by the courts, release methods (parole, pardon, completion of sentence), and actual time served by prisoners. Statistics concerning juvenile delinquency compiled by the Children's Bureau are now drawn from summaries released by state departments of welfare rather than from juvenile courts, and several states have developed statistical bureaus that afford a reasonably adequate picture of local crime. The *Uniform Crime Reports* also contain figures on juvenile arrests that are reported to the FBI by city police departments. See POLICE.

Limitations of Criminal Statistics. The gathering of data concerning criminal activity is a vast undertaking fraught with serious obstacles. The immensity of the United States with its 50 states and countless smaller jurisdictions makes over-all reporting difficult. Because the penal codes of various states and the federal government frequently define the same offense in a different manner, the uniformity of collecting the data, as well as of the data collected, leaves much to be desired.

Changes in the law from time to time and place to place lead to redefinitions of what is criminal. As a result, shifts in statistical figures on crime may reflect only legislative pronouncements, and not actual increases or decreases in criminal behavior. The apathy and carelessness of some public officials in reporting crime lead to a distorted picture in many cases: factors such as public opinion, administrative policies, or politics can cause failure to report the commission of criminal acts or can limit the type of offense noted.

A limitation of the validity of criminal statistics considered important by students of the problem lies in the fact that in order to present a true picture of criminality, the crime data must be related to total population figures. This represents a dilemma for which there has been no solution, since if under modern systems all crime is not reported, obviously the relationships that would be meaningful cannot be ascertained. Criminologists recognize the limitations of criminal statistics and utilize them cautiously though nonetheless effectively within certain boundaries, pointing out that a picture of over-all crime can be only approximated. See STATISTICS.

NEGLEY K. TEETERS

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CRIMMITSCHAU. See KRIMMITSCHAU.

CRINOIDEA, a class of marine animals belonging to the phylum Echinodermata (see ECHINODERMATA) and including the sea lilies and the feather stars. Many of these animals, attached to the ocean floor by means of a stalk, are found at depths up to 12,000 feet. Some species of the feather stars, genus *Antedon*, are free swimming. Crinoids are seldom more than 8 inches long and may be green, brown, red, yellow, or white. The simple crinoid body disk, a cuplike structure known as a calyx, is composed of calcareous plates. Extending from the calyx are five flexible arms that branch to form 10 or more appendages, each bearing feather-like structures known as pinnules. The mouth and the anus are located on the upper surface of the calyx. Food consists of microscopic plankton snared by the tentacles and swept into the mouth by the action of cilia that line the appendages. The nervous system consists of a central ring that sends a cord to each arm. Gonads are usually located in the pinnules, and the eggs may be attached there until hatched or may be dropped into the water. Crinoids are able to regenerate arms or even the body disk. More than 2000 fossil crinoids are known from deposits laid down as early as the Cambrian period (see GEOLOGIC TIME). About 800 living species are known.

CRINOLINE, a stiff cotton cloth. Similar in appearance to gauze, crinoline is highly sized to give it the characteristic stiffness formerly obtained by the use of horsehair combined with linen or cotton. It is used mainly for petticoats, linings, stiffenings, millinery, and bookbinding.

CRINUM, genus of about 100 species of herbaceous plants belonging to the family *Amaryllidaceae*. The showy flowers are borne in umbels and are generally funnel-shaped, fragrant, and white, pink, or red. Plants of this genus require a fairly rich, well-drained soil and are found distributed throughout tropical and warm temperate regions. In northern United States the best-known garden species are *Crinum moorei*, a native of Brazil, *C. longifolium*, and their hybrid *C. powellii*. *C. americanum*, with creamy white petals, is called the Florida swamp lily or southern swamp crinum.

CRIPPLE. See AMPUTATION; CLUBFOOT; HANDICAPPED; POLIO; PROSTHESIS; SPASTIC PARALYSIS.

CRIPPLE CREEK, city, central Colorado, county seat of Teller County; about 20 miles WSW of Colorado Springs and 10 miles SW of Pikes Peak. The city is located on a plateau 9375 feet above the sea. The area was settled in 1890 and the following year gold was discovered in quantity. Cripple Creek remained a thriving gold mining center for several years and then production fell. Since 1934 many new gold deposits have been worked. Total value of gold produced in the area exceeds $400 million. Pop. (1950) 853.

CRIPPS, SIR RICHARD STAFFORD, 1889–1952, British public official, was born in London and educated at University College. He entered Parliament in 1931 and was solicitor general in Ramsay MacDonald's Labour government, 1930–31. A member of the national executive council of the Labour party, 1934–35, 1937–39, he was expelled during 1936 for advocating a "united front" with extreme left wing parties. He was ambassador to Russia, 1940–42. Cripps also served as president of the Board of Trade in Prime Minister Clement Attlee's cabinet, 1945–47, and minister of economic affairs and chancellor of the exchequer, 1947–50. He wrote *This Socialism* (1934) and *Democracy Up-to-Date* (1938).

CRISA or **CRISSA,** ancient town, central Greece, a few miles N of ancient Cirrha, near the modern Delphi. Crisa was settled about 590 B.C. by refugees from Cirrha, which had been destroyed during the first sacred war. Crisa was later destroyed. See CIRRHA; DELPHI.

CRISANA and **MARAMURES,** historical provinces in NW Rumania, located between Transylvania and Hungary. The area was part of Hungary until it was ceded to Rumania at the end of World War I. During the German occupation in World War II most of the area was under Hungarian control.

CRISES, ECONOMIC. See BUSINESS CYCLE.

CRISFIELD, city, SE Maryland, on the Eastern Shore, Somerset County, on Tangier Sound of Chesapeake Bay and the Pennsylvania Railroad; about 95 miles SSE of Baltimore. The area was surveyed in 1663. Crisfield has a large fishing fleet and is a seafood processing center. Diamond-back terrapins are raised commercially. Boats, clothes, tents, and fishing equipment are manufactured. Pop. (1950) 3688.

CRISPI, FRANCESCO, 1819–1901, Italian statesman, was born in Ribera, Sicily. As secretary of war

for the revolutionary party he was active in the Sicilian insurrection, 1849, and in consequence was forced to leave Sicily when the Bourbons were restored. During his exile in the Piedmont he helped Mazzini in Milan and was compelled to flee to England, where he continued to work for Italian unification. In 1859 he joined Garibaldi in his successful Sicilian campaign. Crispi then entered upon an active political career, becoming first a deputy to the Italian parliament, then minister of the interior, and finally premier. His political views changed from the republican leftism of the Risorgimento to monarchism. Crispi was finally forced from office as a result of his colonial policy in Ethiopia.

CRISPIN and **CRISPINIAN, SAINTS,** died ?285, Christian martyrs, probably born in Rome. According to legend the brothers were sent to Gaul as missionaries and were beheaded by the coemperor, Maximianus Herculius. Shoemakers by trade, the brothers are the patron saints of leather workers. Their feast day is October 25.

CRIS RIVER. See Körös River.

CRISTALINA, town, central Brazil, in the state of Goiás; about 85 miles ESE of Anápolis. Cristalina is a mining center in the Serra dos Cristais, an area containing large reserves of quartz crystals. Pop. (1950) 1912.

CRISTOBAL, town, Panama Canal Zone, in the district of Cristobal; a suburb of Colón at the Caribbean terminus of the Panama Canal. Cristobal has railroad yards and harbor facilities on the isthmus connecting Manzanillo Island with the mainland. It was fortified during World War II. Pop. (1950) 417.

CRISTOFORI, BARTOLOMMEO DI FRANCESCO, 1655–1731, Italian harpsichord maker, was born in Padua but in 1687 moved to Florence at the invitation of Prince Ferdinand de' Medici. By 1711 he had invented an instrument described as a *gravicembalo col piano e forte,* or "harpsichord with soft and loud," having a compass of about four octaves. In this instrument hammers were substituted for the quills of the harpsichord and the regulation of dynamics by the player was thereby made possible. Cristofori's later improvements provided for "escapement," or controlled rebound of the hammers, and for dampers which suppressed the vibration of the strings and thus ended the sound on release of the finger keys. Hence Cristofori may be regarded as a pioneer in the development of the modern piano.

CRITIAS, fifth century B.C. Athenian, a pupil of Socrates. Banished from Athens toward the end of the Peloponnesian War, Critias returned with other exiles when the city was taken by the Spartans, 404 B.C., and became leader of the Thirty Tyrants established by the Spartans. He showed his greatest severity toward supporters of democracy (and even toward moderate oligarchs), executing his opponents without trial and seizing their property. He died in 403 B.C. in battle at the Piraeus against the returning democrats. Plato memorialized him in the dialogue "Critias, or the Island of Atlantis."

CRITICAL POINT, a particular combination of temperature and pressure of a vapor-liquid system in which the vapor and liquid states approximate each other and become identical. The numerical values of the temperature, pressure, and volume at this point are called the critical temperature, critical pressure, and critical volume. When solid, liquid, and vapor states exist in equilibrium, so that a small change in the temperature or pressure will destroy one of the states, the system is at a triple point. For any particular substance the maximum number of physical states that may exist in equilibrium occurs at the critical or triple point. It is believed that a vapor-liquid critical point and a solid-liquid-vapor triple point exist for every substance.

Critical Temperature. Molecules of any gas or vapor are relatively far apart. When a gas is compressed, the molecules move closer together until finally, when enough pressure is applied, the vapor condenses to a liquid. When a gas is heated above its critical temperature, however, the energy of the rapidly moving molecules is so great that no amount of pressure can force them into the liquid state (see Liquid). This phenomenon can be illustrated graphically as in Fig. 1. Here the graph shows the constant temperature curves (isothermals) of carbon dioxide near its critical volume and pressure. One gram of carbon dioxide at room temperature 21.5°C and under a pressure of 50 atmospheres occupies a volume of 12 cc. If the temperature remains constant a gradual increase in pressure will decrease the volume of the vapor until point *A* on curve 1 is reached. At this point liquid carbon dioxide appears and the pressure remains constant, despite a decrease in volume, until all the gas has liquefied at point *B*. Further increase in pressure after point *B* has been reached has little effect on the volume of liquid; hence, liquids cannot be compressed (see Liquid). If the vapor is subjected to the same sequence of operations at a higher temperature (28°C, curve 2), it will begin to liquefy at a smaller volume and higher pressure. At 31.2°C the pressure-volume relationship follows curve 3, but when point *C* is reached the vapor immediately changes into a liquid with no separation of the vapor and liquid states as is the case in curves 1 and 2. Point *C* is the critical point, and the temperature at this point is the critical temperature. If the temperature of carbon dioxide is greater than its critical temperature, as shown in curve 4, it is impossible to liquefy gaseous carbon dioxide by increasing the pressure. Thus the critical temperature of any gas is the temperature above which the gas cannot be liquefied by pressure alone. A substance is a gas if it exists above its critical temperature; if it has the same properties as a gas and is below its critical temperature and above the saturation point, it is a vapor.

Critical Pressure and Volume. When the temperature and pressure on a gas or vapor are adjusted until there is an immediate transition to the liquid state, the substance is at its critical point, *C* in Fig. 1, and the corresponding pressure and volume are called the critical pressure and critical volume. In Fig. 1 the critical pressure of carbon dioxide is 73 atmospheres and the critical volume 2.8 cc per gram.

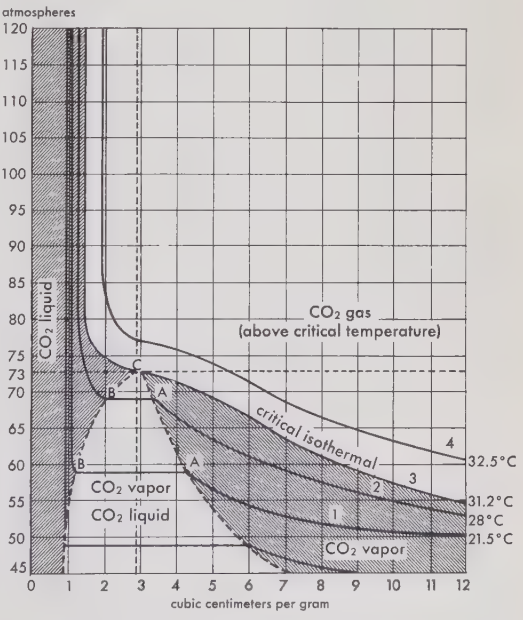

Fig. 1. Isothermal lines of carbon dioxide. Carbon dioxide gas cannot be liquefied by increasing the pressure if its temperature is greater than critical temperature of 31.2°C.

The curve for any gas at its critical temperature T_c and its critical pressure and volume, P_c and V_c, can be expressed by the following equation:

$$V^3 - \left(b + \frac{RT_c}{P_c}\right)V^2 + \frac{a}{P_c}V - \frac{ab}{P_c} = 0,$$

where a, b, and R are critical constants for the given gas. By solving for T_c, P_c, and V_c it is possible to calculate the critical points with the following relationships:

$$\text{(i) } V_c = 3b, \text{ (ii) } P_c = \frac{a}{27b^2}, \text{ and (iii) } T_c = \frac{8a}{27Rb} \quad (15.9)$$

By taking advantage of the different critical points (see table) air can be separated into its major components of carbon dioxide, oxygen, and nitrogen. If a certain weight of air is placed under a pressure of 73 atmospheres and cooled below 31.2°C, the carbon dioxide liquefies, leaving gaseous nitrogen and oxygen. Further decrease in temperature of the gaseous phase results in the liquefaction of oxygen at −118.7°C and 49.7 atmospheres. The remaining nitrogen gas becomes a liquid below −147°C if the pressure is 33.5 atmospheres.

Triple Point. When three physical states of a substance are in equilibrium, the corresponding temperature and pressure comprise the triple point. The physical relation of the three states of water near its triple point is shown in Fig. 2. The curves divide the three states of water into solid, liquid, and vapor. When two areas touch they form a line on the graph marking the points at which two states exist in equilibrium. Point P on the curve OA represents the boiling point of water, and indicates that liquid water and vapor are existing at equilibrium at 100°C and 760 mm (1 atmosphere) of pressure. If the temperature is gradually lowered, so that equilibrium always exists, point P will move toward point O. On reaching point O the temperature will be +0.01°C and the pressure 4.6 mm. Under these conditions solid ice will appear. Point O, the triple point, represents the only temperature and pressure at which ice, liquid, and vapor can exist together in equilibrium. This is also called an invariant point and represents zero degrees of freedom. If either the temperature or pressure were changed, one state would disappear and the resulting system would be solid-vapor, solid-liquid, or liquid-vapor. Line OB is the sublimation curve for ice in equilibrium with its vapor. Point P would move on this line if the temperature or pressure were decreased. The broken line OD, which is an extension of OA, represents the pressure-temperature relation of supercooled water. (See SUPERCOOLING.) Line OC indicates that if the pressure of an ice-liquid-vapor equilibrium at point O were increased, the temperature of the resulting ice-liquid mixture would decrease. The ability to skate on ice illustrates this point. The weight of the skater acts as a pressure that melts the ice and permits the blade to penetrate the surface. At high pressures, curve OC branches out into other triple points representing equilibrium between ordinary ice, modified ice, and liquid water. (See ICE.) In this example it has been assumed that the water was free of dissolved air and that the pressure resulted only from the vapor pressure of the water. Ordinary distilled water at a pressure of 1 atmosphere would have a triple point at 0°C, or the conventional freezing point of water.

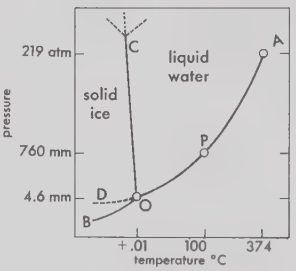

Fig. 2. The triple point of water. At +.01°C the three states of water are found in equilibrium.

CRITICISM, in the arts, is a judgment or evaluation of a work or of an art. One form may be an attempt to evaluate the work as good or bad with respect to the critic's standards; the great bulk of newspaper reviews of books, plays, and music falls into this category. Such criticism is often considered to be simply fault-finding, and it degenerates into this if the critic makes no attempt to justify his objections to a book or painting on grounds other than his mere dislike of the work. Opposed to this is the more appreciative criticism by the critic who attempts to convey his sense of the beauty of particular art works. Another sort of critical writing is that in which the critic attempts to show how general systems of philosophic, religious, or political ideas apply to works of art; so-called Freudian and Marxian interpretations of art are of this type. Still another kind of criticism is that which, by investigating what makes a work "good" or "bad," attempts to establish guiding rules or standards for art; it is this type with which the great critics have been mainly concerned.

Is Criticism Necessary? Criticism in the arts has been reproached on the ground that it is sterile, as opposed to creative acts of the artist, and that it reaches no definite conclusions, seeming to end only in chaotic disagreement among critics. It is not always possible, however, to separate the act of criticism from the act of creation. The artist often criticizes (and corrects) his own work as he creates it: in this sense criticism must be regarded as creative since it is an essential part of the process of creation. Criticism can also be creative when the critic attempts to formulate the reasons for the success or failure of a work, since by so doing he contributes to the general body of knowledge. As for the second reproach, the apparent confusion among critics reflects the complexity of their subject matter; actually, criticism has been far from unproductive in terms of insights achieved and principles discovered.

Understanding the Critic. Three factors determine what a given work of criticism will be like: (1) the author (a man of a certain kind, living in a certain period, having a certain kind of background); (2) his subject; and (3) the language or conceptual and logical framework in which he discusses or illustrates his subject. The differences among critics, and their disputes with one another, are often the result of unperceived differences in language, or critical framework. What one critic means by "poetry" or "plot," for instance, may be entirely different from what another critic means by these words.

Two questions which may be asked about any given critic to help clarify his meaning are: first, *what is his subject matter?* and second, *what is his method?* Upon what aspects of his subject does the framework he is using *force* him to concentrate, and about what aspects of the subject does it *permit* him to talk? How are the principles and distinctions which he uses in his discussion derived, and how are they used to give the readers valid and relevant knowledge about the subject matter? In general, critics employ one of two methods. In the first, the critic starts with the work of art itself and attempts to discover, by reasoning back inductively to the causes of the work,

CRITICAL CONSTANTS OF GASES

Gas	Critical Temperature °C.	Critical Pressure (Atmospheres)
Ammonia	132.4	111.5
Argon	−122.	48.
Carbon monoxide	−139.	35.
Carbon dioxide	31.2	73.0
Methane	−82.5	45.8
Nitrogen	−147.	33.5
Oxygen	−118.7	49.7
Propane	96.8	42.
Water	374.	219.5

what the conditions for such a work are, or what makes for "goodness" in such a work. The second method is essentially deductive: the critic starts with some general principle and attempts to show how it applies to the art he is discussing or to a given work of art. When a critic's views are clarified in terms of answers to these two major questions it is easier to see in what respects his critical system differs from, or is similar to, the systems of other critics. If the systems themselves are to be evaluated two further questions must be considered. The first of these is internal (within the framework chosen by the critic): *is the argument logical and consistent?* The second is external and relates to the justification of the critic's frame of reference itself: *how many significant questions about the work or art under discussion does this framework permit the critic to answer, and does it allow him to answer these questions better than he could under any other framework?*

Criticism in the Plastic Arts and in Music. Criticism in any of the arts is subject to the foregoing mode of examination. In the plastic arts and music, however, it has had a much briefer history than has literary criticism. While art criticism, possibly of a high order, is thought to have existed in classical times, none has been preserved. Historically, criticism in the plastic arts appeared first during the Renaissance. Interest in art for its own sake had not been cultivated by the early Christian church in the West, and art had been tolerated in the Middle Ages only as it served in the glorification of God and the instruction of His worshipers: art had not been appreciated —and so had not been criticized—as a thing in itself. With the Renaissance, however, the attitude toward art changed, and criticism reappeared: at first it was limited to disputes about the relative value of sculpture and painting, but later, with the development of classicism, definite critical principles began to emerge. Critics felt obliged to prove that art was morally good, maintaining that although painting and sculpture were imitative arts, what they imitated was not nature but the ideal. This ideal was determined with the help of mathematics, which enabled the artist to establish correct proportions; however, nature *was* imitated in matters of color and texture. Once the ideal was established, moreover, it was forcibly taught and imposed. Eventually, of course, there was a reaction to this rigidity. Dubos and Diderot criticized the doctrines of the Académie and the salons; the Romantics, going even farther, rejected criticism altogether and glorified the artist and his individual vision, making him a principle to himself. In terms of theory, the plastic arts remained at this point through the first half of the twentieth century, with minor excursions to be found in such conceptions of art as would make the nature of the medium the dominating principle of self-expression.

Criticism of music tends to parallel rather closely the history of technical development in that art. Plato discussed various kinds of music in terms of their supposed effects on the character (and Renaissance and Baroque musicians shared this concept of music as morally effective); Pythagoras discussed music as mathematically determined; and from time to time in centuries following some musicians made mathematics a basic principle of composition. But the history of music criticism in general was one of reactions and counterreactions to new concepts of structure, and harmonic and melodic development; in such criticism the individual tastes of composer and critic were the primary principles. See Aesthetics; Music.

Literary Criticism

The Greeks. Recorded literary criticism begins during the classic period of Greek thought (fifth century B.C.) with Aristophanes' *The Frogs*, which ridicules certain characteristics of the styles of Aeschylus and Euripides. Plato considered and evaluated poetry, but did so primarily in terms of its moral effects, particularly with respect to its efficacy in bringing man to a comprehension of the true and the good. Poetry he considered to be pernicious, since poets deal not with the truth but with fictions, which are at best vague shadows of the truth. Aristotle's *Poetics* (which like Plato's discussion must be considered in the light of his whole philosophic system) was a treatise on the "science" of poetry, and was the first work devoted specifically to literary criticism. Over the centuries it has been perhaps the most influential single work in this field.

Starting with the works of poetry which he knew, Aristotle first proceeded inductively to discover what these works had in common that distinguished them from other human activities, and from other forms of composition in language; he then went on to differentiate the various kinds of poems. Finally he attempted to discover by induction what characteristics works of each kind must possess if they were to be good, the kind of poetry considered at greatest length in the *Poetics* being tragedy. In Aristotle's system, poetry was distinguished from other forms of verbal composition by the fact that it was one of the fine arts, the products of which had no purpose beyond that of being beautiful; the sign of their beauty or goodness was that they produced some kind of pleasure. Important in Aristotle's criticism was the conception of *the work as a whole*, with all its parts directed toward the creation of a particular emotional effect. In the case of tragedy this effect was one of pity and fear. Other kinds of poetry were defined in terms of the emotional effect peculiar to each. For Aristotle, a good work was one in which all the parts of the work combined to produce the emotional effect proper to that kind of work and produce it to the maximum degree.

After Aristotle, Greek criticism tended to limit itself to verbal criticism (analysis of a poet's words as appropriate for poetry or not) and to the literalistic examination of poetic statements. This futile and pedantic tendency to discuss works on a purely verbal level was the outward sign of a radical shift in the general framework of critical discussion. Poetry came to be considered, not as an art whose purposes were distinct from those of other types of verbal creation such as rhetoric, but as merely another form of composition in language. The grammarian-critics who flourished in Bergamos and Alexandria in the second and third centuries B.C., were probably more responsible than any other group for this conception of poetry. Later this view of poetry may be traced through the Latin rhetoricians to critics of the Renaissance period and after.

The grammarian Dionysius of Halicarnassus (died 7 B.C.) was the most important of the critics concerned solely with criticism on the verbal level. Greatest of the later Greek critics, however, was Longinus (213?–?273), whose treatise *On the Sublime* was notable both for its sensitivity of perception and intuition and for the beauty of its style. Great poetry, according to Longinus, produced in its audience an irresistible "moving of the soul," which arose from the sublimity in thought and expression of the poem or passage. This sublimity has its source in the genius of the author, a genius trained by frequent reference to various sublime passages of the classical authors, which served as touchstones by which later writings could be judged.

The Romans. Latin criticism had, over a long period, considerably greater influence than did Grecian criticism (partly because of the fact that during the Middle Ages most works in Greek were inaccessible to Western scholars, who were even unaware of their existence). The most important characteristic of Latin criticism was its adoption of *rhetorical* standards of evaluation. The earlier shift in framework (according to which poetry was classified in terms of its medium rather than in terms of its ends) made this *rapprochement* of poetry and rhetoric very easy: if poetry was merely a form of language, then the rules

which applied to other forms of language also applied to poetry. Rhetoric was the type of verbal composition which the Romans knew best: skill in rhetoric commanded attention and reward both during the last years of the republic and under the empire. So Latin critics tended more and more to judge works of art not as good or bad in themselves, but in terms of whether or not they pleased the audience; the reaction of the popular audience became the standard for evaluating works.

The first major Latin critic was Cicero, whose treatises on rhetoric were well known in the Middle Ages and Renaissance. Cicero was not outstanding for originality or consistency; but the terms in which he stated his subject, and the definitions and principles which he laid down, continued to influence the language in which later thinkers—rhetoricians, theologians, philosophers, and critics—stated their problems, and consequently to affect the way in which they understood those problems. (For example, he applied to literature the rhetorical distinction between subject matter and its expression [*res* and *verba*], a distinction which tended to divert attention from the poetic work as a whole but which later critics generally accepted.) Cicero's influence was considerable, both directly and indirectly. Also influential was Horace, whose *Art of Poetry* was the best-known treatise on poetry until Aristotle's *Poetics* was rediscovered. According to Horace, the aim of poetry was "either to teach or to delight," and the *Art of Poetry* was for the most part a series of rules telling the poet what he must and must not do if he was to succeed in pleasing or instructing his audience. Quintilian, the third major Latin critic, concerned himself altogether with the art of rhetoric in his *Institutio oratoria*, a detailed work on the training of the orator.

Middle Ages and Renaissance. During the Middle Ages formal treatises on rhetoric, together with scholastic works on prosody and meter, supplanted true criticism to some extent. Serving as a bridge between the criticism of the Middle Ages and that of the Renaissance was Dante's *De vulgari eloquentia*, in which he established the "vulgar" tongue (that is, Italian, as opposed to Latin) as a proper means of literary expression, and laid down rules for the composition of poetry in Italian.

With the Renaissance and the development of a vernacular literature, criticism as a type of literary study distinct from rhetoric reappeared. The first critical works of the Renaissance were found, as might be expected, in Italy. Among the earliest of these was Marco Girolamo Vida's *De arte poetica* (1520), a poem devoted to instructions on epic writing, and influenced by Virgil's example and Horace's precepts. Aristotle's *Poetics* did not become clearly influential until it was published with a commentary by Francesco Robortello in 1548. However, Robortello interpreted Aristotle in the light of the rhetorical tradition which he had inherited from the Latin critics and the Middle Ages; this led to serious misconceptions and distortions of Aristotle's critical theory. These misconceptions were shared by Robortello's successors, and as a result Aristotle was often wrongly cited as an authority for the excesses of classicism. Julius Caesar Scaliger's *Poetices libri septem* (1561) was generally regarded as the first major document of the classicist school, and exhibited the chief characteristic of that school—the attempt to lay down exact rules for composition in the various genres of poetry, justifying the rules imposed by reference to classical authors, especially Aristotle. These critics did not share Aristotle's critical framework, nor did they hesitate to disagree with Aristotle on crucial points whenever the solution of their own critical problems demanded that they do so. One of the major problems of early Renaissance criticism was to justify the existence of poetry (which for critics of that period usually meant something closer to fiction) against the objections of the church and of neo-Platonist philosophers. The defenders of poetry, misinterpreting Horace, justified poetry on the grounds that it was really pleasurable instruction, its aim being to teach and delight. Thus Scaliger declared that the aim of poetry was instruction accompanied by pleasure. Literature, including poetry (which Scaliger defined simply as composition in rhythmical form), was treated primarily as a form of language whose general aim was persuasion, rather than the comprising of a number of distinct arts; since words represented things, works had to be judged in terms of the kinds of things represented. The concept of the three unities (in time, place, and action), which was perhaps the best known classical dogma, was formulated by Lodovico Castelvetro, and marked in a sense the culmination of the rhetorical tendency to construct standards for poetry in terms of the audience.

For Castelvetro the audience was specifically one made up of the common people—the "ignorant multitude" and "rough crowd"—and was primarily to be pleased, not instructed. This audience supposedly had a limited imagination and could therefore be pleased only by the credible—that which its own experience verified. Therefore the unities of space and time were necessary, since such an audience, limited to the evidence of its senses, would not find an action spanning several days and occurring in several places believable if it saw that action compressed into several hours and presented on a single stage; unity of action was a consequence of unity in space and time, and contributed to the simplicity, and therefore the pleasurableness, of the work. For Castelvetro, poetry was distinguished by its subject matter rather than by its rhythmical form: "Verse does not distinguish poetry, but clothes and adorns it." As can be seen, the classicists often differed considerably among themselves, but the rules for composition which they laid down (rules much like those of Horace) tended to be similar; the influence of this rule making was considerable on their successors as well as on their contemporaries.

France and England. In France literary criticism did not appear until the last half of the sixteenth century. As in Italy it developed out of the rhetorical tradition, but such critics as Thomas Sebillet, in his *L'art poétique francoys* (1548), showed the influence of the Italian classicists as well. The great critics of the French Renaissance, however, were the members of a group of poets known as The Pléiade, who (like Dante) were mainly engaged in defending their native tongue as a proper language for literary expression, and in setting down rules for composition in French. Major critical works of this group include Joachim du Bellay's *Défense et illustration de la langue française* (1549); Pierre de Ronsard's *Abrégé de l'art poétique français* (1561) and his prefaces to the *Franciade;* and Vauquelin de la Fresnaye's *L'art poétique* (1605). Du Bellay, while sharing the conception of poetry as a form of language, differed from traditional standards for evaluation, which were mainly rules for elegance and eloquence in the language used and were not derived from the nature and preferences of the audience.

In England formal criticism did not appear until the last quarter of the sixteenth century. George Gascoigne's *Certayn notes of instruction* (1575) and King James VI's *Reulis and Cautelis* were technical treatises on English and Scottish poetry respectively. But the first work of general criticism was Sir Philip Sidney's *Apologie for poetrie* (written ?1583, published in 1595), a defense of poetry against the old charge of immorality. This being his critical problem, it was not surprising to find that for Sidney poetry was essentially equivalent to fiction and that it had as its aim "to teach and delight." Sidney's critical position was further indicated by his censure of contemporary English literature for not having adhered closely enough to classicist rules for composition.

The most important critical debate of the last quarter of the sixteenth century was over the technical question of classical meters versus rhymed verse in English poetry, and was carried on by William Webbe, Gabriel Harvey, and Thomas Campion, who favored classical metrics, against Samuel Daniels. After the turn of the century English writers seemed to have been concerned with more general problems of criticism; examples of this are Francis Bacon's discussion of poetry in his *Advancement of Learning* (1605), and Ben Jonson's various critical remarks, which reveal a strong leaning toward classicism, tempered by his equally strong common sense. To the extent that English criticism existed during this period, it tended toward classicism; but fortunately English *literature* was not yet subservient to classicist criticism.

In France, on the other hand, classicism reigned almost unchallenged during the seventeenth century. Pierre de Laudun argued against "the unities" in his *L'art poétique* (1598), and Alexandre Hardy and François Ogier wrote prefaces defending a freer dramatic form; but the coming of François de Malherbe put an end to these rebellions against critical dogma. Malherbe's influence is hard to explain, since his criticism consisted mainly of extremely brief marginal notes in commentaries on other authors; but it was nonetheless powerful, and insisted always on adherence to established rules. Still more powerful were Cardinal Richelieu and the newly formed Académie Française, who together caused Corneille's *Le Cid* to be censured for its violations of the rules, in Chapelain's *Sentiments de l 'Académie sur . . . le Cid* (1637)—a document which established definitely the characteristics of French classical drama. Equally rigid rules were laid down for epic by Pierre Mambrun and René le Bossu. René Rapin and Nicolas Boileau-Despréaux both showed the influence of Longinus (whose *De sublimitate* was translated by Boileau in 1674); otherwise Boileau's work was in the classicist tradition, his famous *L'art poétique* (1674) being perhaps the most representative document of French classicist criticism, with its discussion of the various genres of poetry and its insistence on a truth to nature best achieved by the imitation of classical models.

In England criticism did not become an important branch of learning until shortly after the Restoration, when the essays and prefaces of John Dryden seem to have awakened interest in this form of literature. Dryden was strongly influenced by classicism, and his critical works (especially the *Essay of Dramatic Poesy*, 1668) probably helped to establish the classicist tradition in England. Also contributing to the acceptance of classicism were the many translations of French critics published in England between 1660 and 1700. English classicism reached its extreme during this period in Thomas Rymer's critical works on tragedy, in which he condemned Shakespeare for his failure to conform to the rules for tragedy.

Classicism in its traditional form did not last long in England, however. After 1700 another general shift in critical framework began to take place. In the Renaissance critics had been engaged mainly with the problem of relating the nature of poetry in general (conceived as a form of language which instructed its audience in a pleasurable way) to its manifestations in particular poems, through discussion of the established genres and of the proper mode of composition in each. But after 1700 (although poetry was still regarded as a form of verbal composition) critics became less concerned with discussion of the specific genres of poetry and more concerned with discovering the general quality of poetry itself—the common structure which underlay *all* the genres. The first phase of this change appeared in the eighteenth century critics' concern with the source of the natural principles on which the rules of art were held to be founded. In the classicist tradition a writer seeking the principles of art could go either directly to nature or to the great poets and critics (Virgil, Horace, Aristotle) who had understood and employed these principles and exhibited them in their works. In the eighteenth century, however, the authority of criticism and its body of rules began to be questioned, and critics began to appeal *directly* to nature, seeking justification for rules of art in various supposed qualities of nature or human nature. Much criticism written during this period was concerned with broad characteristics of subject matter and particularly with the way in which various subject matters affect the emotions; treatises were written characterizing various subject matters as "sublime," "picturesque," "ludicrous," and so on. A list of all the men who contributed to the body of English criticism during this period would be very long, for almost every author, scholar, and philosopher of consequence was also a critic. Among the important contributors were Addison, Pope, Hume, Hogarth, Thomas and Joseph Warton, Burke, and Reynolds. Perhaps the greatest of the eighteenth century critics was Samuel Johnson, whose work demonstrated clearly the tendency to question strict classicist doctrine and appeal instead to nature. By "nature" Johnson meant the natural, instinctive emotional reactions of the common man, holding that every critical dogma must be submitted to this empirical test to determine its validity. In France the critics who shared this framework were Jean Baptiste Dubos, Diderot, and the Encyclopedists. In Germany their great counterpart was Lessing.

Romanticism. With the coming of the Romantic period a second phase of this shift in framework was seen. During this period critical principles tended to be drawn not from the emotional reactions of the audience but from the supposed sources of poetry in the faculties and operations of the mind; critics were therefore concerned with the nature of the poet and with the moral and psychological bases of poetry. The great English critics of the nineteenth century—Wordsworth, Coleridge, and Matthew Arnold—all shared this fundamental concern with the poet and his nature. French criticism was also affected by this change in framework but French critics tended to be concerned less with general inquiries into the psychology of the poet and more with the historical, geographical, and social influences upon him. First to introduce such questions into French criticism were Mme. de Staël and Chateaubriand. Criticism in terms of external influences on the poet was further developed in the work of such later critics as Victor Cousin, A. F. Villemain, C. A. Sainte-Beuve, and H. A. Taïne (who systematized this approach to criticism).

Twentieth Century. In the third and fourth decades of the twentieth century there appeared a third phase of the shift toward greater concern with the underlying structure of poetry. Critics in England and America came to be concerned mainly with poems and poetic language as symbolic of some reality in the experience of the writer or reader. Poetry was viewed by these critics as a special kind of language used to communicate special kinds of thought which other forms of art could not express. The so-called new criticism of the 1920s, '30s, and '40s was therefore concerned with making this special, symbolic language clear to readers of poetry so that they might not miss the deeper and more subtle meanings which "good" poetry was thought to convey. Critics of this school tended to choose one of two ways of going about this task. For the first group, which included such critics as T. S. Eliot, I. A. Richards, William Empson, Wilson Knight, John Crowe Ransom, R. P. Blackmur, Allen Tate, Cleanth Brooks, and Robert Penn Warren, poetic language was still a form of statement in words; they were concerned, therefore, with stating what the nature of this special language was, and with showing how it could express truths or values which ordinary speech could not. The second group, which included such critics as Kenneth Burke, Edmund Wilson, Lionel Trilling, Richard Chase, and Francis Fergusson, was concerned with

symbolic meanings which were not explicit in the words of a poem. These critics believed that the real meaning of a poem never appeared on the surface, but was contained in its appeal to a primitive, archetypal, unconscious level in man's nature, and that the duty of the critic was therefore to elucidate that real meaning (of which the poet himself may have been unconscious). Aided by cultural anthropology and psychoanalysis, the critic attempted to discover the "myth" or other appeal to the reader's emotional substructure, which he felt constituted the real meaning of the poem—however different from this real meaning the poet's conscious purposes may have been.

The critical approach of the grammarian-critics of Alexandria was thus continued through some 23 centuries. Only one major critic, Benedetto Croce, in the twentieth century, broke away from the critical framework in which poetry was regarded as merely another form of literary composition. For Croce, as for Aristotle, poetry was classified with the other fine arts and was carefully differentiated from other forms of verbal composition. His criterion for this classification was not that of purpose, however, but was based on the common nature of the fine arts as "lyrical intuitions." VIRGINIA D. OGGINS

Criticism in History and Philosophy is the analysis of sources to determine their genuineness and (in history) their *value* as evidence. External criticism is used to determine the genuineness of a historical document; this type of criticism is concerned with questions of forgeries, establishing authorship, dating, and the circumstances of the origin or the source. External evidence (such as the paper, ink, or type faces of the document) is studied together with the internal evidence, which is supplied by analysis of the contents of the document. This study, which approaches but is not identical with internal criticism, ranges from examinations of the handwriting and grammar to such questions as whether an author writing in a given period could have known a given fact. These critical methods have been used to expose a number of forgeries, of which perhaps the most famous is the "Donations of Constantine," a document purporting to be the Emperor Constantine's grant of the lands of Italy to the papacy. Lorenzo Valla (1406–57) proved this document to be spurious by showing that its language, grammar, and style differed widely from those universally used during the time of Constantine, and that the conditions described in this forgery referred not to the period of its purported origins but to those of the eighth century.

In criticizing a historical or philosophical source the task is usually not to accept or reject an entire document, but to separate its authentic from its spurious parts. A purported treatise of Aristotle, for example, might include parts "by" Aristotle (actually lecture notes, of course) together with additions by later writers. It is the task of external criticism to reconstruct the original source and to show, if possible, who added this or that section. In the nineteenth century these methods of historical criticism were applied by biblical scholars to the evaluation of the Scriptures as historical sources and to separate authentic from spurious parts. This movement was the so-called higher criticism, but twentieth century scholars have grown to distrust much of this work.

Internal Criticism. In philosophy, once an original source has been reconstructed (that is, spurious additions have been identified and removed) criticism is finished. For historical purposes, however, a source must be subjected to internal criticism—that is, its value as historical evidence must be determined. The methods used are similar to those used by an examining judge in evaluating testimony. The author of the source is judged as to whether or not he was in a position to observe the event he describes. Bias of the author (as of a witness) is noted, since it may distort the truth. For example, the memoirs of a statesman are likely to seek to establish that his policy was correct, while documents published by a government (particularly during wartime) are usually more concerned with making a case than with disclosing impartial truth. Fortunately, the historian usually will have several different sources covering the same events and can judge each in terms of the others in his attempt to arrive at the facts of the matter. But in endeavoring to do this the historian himself is influenced, even guided, by his personal critical framework. While absolutely objective historical criticism is an impossibility, the fact that one historian's judgments as to the truth will be subject to criticism by other historians having different critical frameworks provides a double safeguard for readers: it puts the historian on his guard against his own bias and insures that his judgments will be supplemented by the differing judgments of other historians working with the same source material. See HISTORY; PHILOSOPHY. GEORGE KREN

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CRITTENDEN, JOHN JORDAN, 1787–1863, U.S. political leader, was born near Versailles, Ky. He was graduated from William and Mary College in 1807 and practiced law in central and western Kentucky; in 1809 he was attorney general for the Illinois Territory. In 1811 Crittenden was elected to the Kentucky legislature; after service in the war of 1812, he returned to Kentucky, was a leading attorney in Frankfort, and again served in the legislature. He served in the U.S. Senate, 1817–19, and later was a strong supporter of Henry Clay and Pres. John Quincy Adams. Crittenden again served in the Senate, 1835–41, 1842–48, and 1855–61; as a Whig he was attorney general under William Henry Harrison, 1841, and under President Fillmore, 1850–53. He was governor of Kentucky, 1848–50.

Although not an abolitionist, Crittenden hoped that Negro slavery might eventually be ended and worked unceasingly before the Civil War for a settlement of this and the other issues. The Union was almost a passion with him and in December 1860 he proposed the "Crittenden Compromise," which would have restored the Missouri Compromise; his plan was defeated and he returned to Kentucky. Elected to the House in 1861, he opposed the Emancipation Proclamation and "harsh" measures toward Kentucky and other states. A sensitive man, Crittenden loved political life but was considered completely honest both in his private opinions and public activity. E. B. LONG

CRITTENDEN COMPROMISE, a measure for adjustment between the Northern and Southern states of the United States proposed in the Senate by John J. Crittenden of Kentucky on Dec. 18, 1860, when hostilities between the two sections seemed imminent. Crittenden's resolution provided for the adoption of six amendments to the federal Constitution. The most important was that the line of 36° 30′N lat. should divide slave from free territory in areas under territorial government, but that new states should be admitted into the Union with or without slavery as the state constitutions might provide. Other proposed amendments prohibited Congress from hindering or preventing interstate slave trade and from abolishing slavery on the federal

reservations within the states; or within the District of Columbia, so long as slavery existed in Maryland or Virginia, without the consent of the inhabitants or compensation to the owners. Moreover, Congress was to provide by law for payment to slave owners of full value for any fugitive slaves not returned because of Northern opposition. A sixth proposed amendment forbade future disturbance of the compromise. In addition to the amendments, the Crittenden resolution called on Congress to promote the return of fugitive slaves. The compromise scheme was considered in committee, but rejected, mainly because Republicans insisted on prohibiting slavery in the territories. Its proposals, however, were widely discussed and often approved.

CRIVELLI, CARLO, 1430?–?95, Italian painter, was born in Venice. In 1457 he was fined and condemned to six months in prison for the abduction of a married woman; subsequently he fled Venice and lived the rest of his life in the Marches of central Italy. The earliest work attributed to him is a *Virgin* (at Verona), showing the influence of Antonio de Negroponto. Crivelli's art is the culmination of the Byzantine painting of the West, brought to the highest level by the leaven of the Renaissance, which affected Crivelli indirectly. He owed much to Paduan art, but the splendor of decorative detail in his paintings is essentially medieval Greek. Thus the methods and traditions of the East were in Crivelli united with the influence of Florence. A subtle colorist, Crivelli stressed design. Although his figures are usually tender and sweet they are sometimes almost fierce with emotion. Living outside the main stream of Italian culture and separated geographically from the progress of painting in his native Venice, Crivelli painted in the old techniques of tempera during a time when his contemporaries were already experimenting with oils. Most of his best works are readily identifiable by characteristic festoons of fruits and painted marble surfaces, and by richly scattered metallic ornamentation. Among his outstanding paintings are *The Virgin and Child* (National Gallery, London), *St. George and the Dragon* (Gardner Museum, Boston), *The Crucifixion* (Art Institute, Chicago), *The Virgin and Child Handing the Symbolic Keys to St. Peter* (Berlin Museum).

ANTHONY KERRIGAN

CRNA GORA. See MONTENEGRO.

CROAGHPATRICK, mount (2510 ft.), Ireland, in County Mayo, SW of Westport, on the S side of Clew Bay. St. Patrick is closely associated with the mount in tradition, and it has been a place of pilgrimage for centuries.

CROAKER, any one of a group of marine fishes named for a characteristic sound they produce by vibrating the walls of their modified swim bladder. The Atlantic croaker, *Micropogon undulatus*, is a member of the family *Sciaenidae*, which also includes weakfishes and the drums. The average Atlantic croaker weighs about a pound, although individuals weighing up to 5 pounds have been caught. A principal food fish, especially in the South Atlantic States, the croaker is easily distinguished from near relatives by its underslung mouth and the minute barbels on both sides of the lower jaw. Croakers feed on crustaceans, worms, and other marine animals. Spawning occurs from late summer to early winter in the Atlantic, and from early autumn to midwinter in the Gulf of Mexico. Both sexes of the Atlantic croaker produce sounds, but those of the male are much the louder. Other croakers are the spotfin croaker, *Roncador stearnsi;* king croaker, *Genyonemus lineatus;* yellowfin croaker, *Umbrina roncador;* and the black croaker, *Sciaena saturna.*

CROATIA, or Hrvatska, a division of Yugoslavia, bounded on the N by Slovenia and Hungary, NE by Hungary, E and SE by Serbia, S and SE by Bosnia and Herzegovina, S and W by the Adriatic Sea; area 21,840 sq. mi.; pop. (1953) 3,913,753. Croatia extends northeast to the Drava River; southwest its rugged coast line runs from Fiume (Rijeka) to Split. The coastal islands Krk, Cres, Unije, Lošinj, Dugi, Pag, and adjoining islets are included in Croatia.

BURTON HOLMES–EWING GALLOWAY

Croatian women in native dress arrange their wares at the Jelačić Square market in Zagreb. Although Croatia is an agricultural country, only one-third of the land is arable.

Topography. Croatia is generally mountainous. The Julian Alps extend south across the western part of the province to meet the coastal ranges of Kapela and Velebit at the southwest corner, and the Bilo Mountains rising along the eastern border. The Kapela Range, covering some hundred miles or so of Karst plateau, culminates in peaks of 3000 feet. This region is cold, with heavy snowfall in winter. Rich, fertile plains between the Sava and Drava rivers are found in the eastern and southeastern sections of Slavonia, an area of hot summers. Along the Adriatic, the climate is mild in winter and sometimes very hot in summer. Both mountains and plains are often swept by the bora, a strong northeasterly wind that is unusually cold and accompanied by rain, sleet, or snow. Croatia's chief rivers are the Danube, Drava, Una, Sava, Kulpa, Sotla, Lonja, and Bosut.

Social and Economic Factors. Most of the inhabitants are Croats. The considerable Serb minority suffered great loss of life in the internal Croat-Serb fighting during World War II. The majority of inhabitants are Roman Catholics; a minority are Orthodox. The Latin alphabet predominates, but Cyrillic characters are used by the minority.

The capital is Zagreb, which has a university and other higher institutions of learning. Other important cities are the ports of Rijeka (Fiume), Dubrovnik, Pula (Pola), Šibenik, Zadar (Zara), Split, Senj, Osijek, and Karlovac.

Croatia's resources include bauxite, coal, lignite, lead, zinc, gold, iron, copper, mercury, sulfur, marble,

Location Map of Croatia

YUGOSLAV STATE TOURIST OFFICE

Dominating Zagreb's skyline are the Roman Catholic church, right, on Capitol Hill, seat of archbishops since the Middle Ages, and in the center the church of the Jesuits.

limestome, asphalt, gypsum, and salt. Croatia is, however, essentially an agricultural country. Production suffered during World War II and in the immediate postwar period because of the forcible collectivization introduced by the Communist government. After Yugoslavia's break with the Soviet Union in 1948, however, collectivization measures became less drastic, and peasants were allowed to go back to individual methods of farming. By 1955, out of 1600 collective farms, only 200 remained. A third of the land is arable or garden land under intensive cultivation; a third is in forests of oak, fir, birch, ash, maple, and chestnut; and the rest is in meadow and pasture where great numbers of horses, sheep, oxen, and pigs are raised. Cereal grains and potatoes are the chief crops, with corn, sugar beets, hay, hemp, and flax following in importance. There are large vineyards and walnut groves. Plums, apples, pears, oranges, and figs are grown. Poultry farming and bee-keeping are important.

Industries include shipbuilding, fisheries, lumber and woodwork mills, glass and chemical (producing sulfur for commercial use) plants, distilleries, and flour mills. The principal manufactures are furniture; woolen, cotton, and silk textiles; tobacco; rope; paper; and wax products. Exports are lumber, corn, wheat, wax, apples, honey, wines, plum brandy, and wooden articles and utensils. An electrotechnical plant at Zagreb produces equipment for hydroelectric installations in Yugoslavia and for export.

The province has about a thousand miles of railway. Water transportation is provided by the Sava, Drava, and Danube rivers. Foreign tourist traffic was of increasing importance to the economy in the 1950s.

History. Croatia had its first powerful government under the leader Tomislav, who was crowned king in 925. The Croatian dynasty died out in 1097, and the country was forced to enter into a union with Hungary, keeping some autonomy, including retention of the diet. The union lasted 400 years, but Croatia gradually became a vassal of Turkey; by 1526 Slavonia, a separate monarchy, and much of the rest of Croatia were included in the Ottoman Empire. The Hapsburgs continued to rule the remainder. In 1687 Hungary assumed control of both Croatia (Horváth Ország) and Slavonia, continuing to govern them until 1918. As early as 1868 both regions were granted a degree of autonomy, and in 1881 Slavonia was combined with Croatia into one administrative unit.

As subjects of the large Austro-Hungarian Empire, the Croats, already linked to the West through Roman Catholicism, became more westernized than the Serbs. In 1918, when Croatia, with great initial enthusiasm, was united with Serbia and other South Slavic regions to form the Kingdom of Croats-Serbs-Slovenes, or Yugoslavia, Serbian attempts to merge the different groups into one nation oriented toward the Eastern Orthodox church aroused antagonism (see RADITCH, STEFAN). The differences between Croats and Serbs continued throughout the period between World Wars I and II. During the tension preceding World War II the Yugoslav government yielded and restored the province of Croatia, with Zagreb as capital, in August 1939. Autonomous Croatia consisted of most of the former Hungarian crownland of Croatia and the coastal province of Dalmatia as far south as Dubrovnik. During the war a puppet government under the Italians ruled Croatia. While some Croats helped in the German invasion of Yugoslavia, others joined the guerrilla forces of Gen. Draja Mikhailovich and Marshal Tito. In 1943 Croat guerrillas formed their own legislature to administer the territory they held. Dalmatia was included within Croatia in 1946 and became an administrative region in 1949. Most of Istria was absorbed into Croatia in 1947. See YUGOSLAVIA; SERBIA; MIKHAILOVICH, DRAGOLIUB; TITO; ZAGREB.

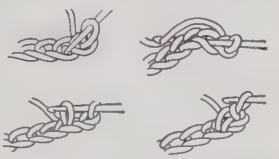
CROCE, BENEDETTO, 1866–1952, Italian philosopher who believed that the thinking man who seeks to withdraw from the practical struggles of the world condemns his intellect to death, was born in Pescasseroli, Abruzzi, but spent his childhood in Naples. When he was 16 his parents, who were wealthy landowners, were killed in an earthquake. Young Benedetto, himself severely hurt, was rescued only after being buried in rubble for 12 hours. He studied law at Rome University, 1883–86, years he later described as the darkest and saddest of his life. Back in Naples, he first devoted himself to historical and philological studies; but soon, influenced by the works of Giambattesta Vico and Francesca de Sanctis, he plunged into more philosophical work. In 1902 he published *Estetica* (*Aesthetic*, 1913), the first volume of his major work, *Filosofia dello Spirito*, four volumes, 1902–16 (*Philosophy of the Spirit*, 1913–22). In 1903 he founded the influential review, *La Critica*, which he edited for 27 years, and to which he contributed numerous articles. He was appointed senator of the kingdom of Italy in 1910. Four years later he married. During World War I, he supported the Allied cause, but vehemently rejected the view that the war was a struggle between higher and lower cultures. After the war he was minister of education in the Giolitti cabinet, 1920–21. When Mussolini (who once boasted that he had never read a page of Croce) came to power, Croce, an avowed enemy of the dictatorship, was forced out of public life. From 1926 until the fall of Italian fascism in 1943 mention of his name in public was forbidden. Although the regime dared not harm Croce or prevent publication of his works, all his writings were placed on the *Index expurgatorius* of the Roman Catholic church in 1932.

The fundamental principle of Croce's philosophy is that spiritual (mental) activity constitutes the whole of reality. For him there was no objective world outside the mind's subjective awareness of its own activity, which took two forms—one intellectual, the other practical. Intellectual activity was in turn divided into intuition (art) and abstraction (philosophy); the mind's practical activity was split into economics and ethics. The subject matter of history, Croce averred, was the human spirit concretely manifesting itself in art, philosophy, economics, and ethics. History was, therefore, the fullest development of man's search for truth, absorbing and becoming identical with philosophy. Reacting against the nineteenth century's overly optimistic faith in scientific method, Croce denied that it was possible through science to acquire any genuine knowledge of reality. Science was merely a respectable, useful, practical way of manipulating dead things and "putting them in order."

Croce was best known outside Italy for his aesthetic theories. He maintained that artistic intuition was an initial reaction which made no distinction between real and unreal images. Therefore artistic intuitions were not perceptions of *reality* (which distinguish real and unreal) but "pure intuitions" of the individual (as distinct from the universal).

Croce published more than 50 volumes during his lifetime, among them *Materialismo Storico ed Economia Marxistica*, 1900 (*Historical Materialism and the Economics of Karl Marx*, 1914); *Storia d'Italia dal 1871 al 1915*, 1928 (*History of Italy, 1871–1915*, 1929); and *Storia come Pensiero e come Azione*, 1938 (*History as the Story of Liberty*, 1941). EUGENE KRAMER

CROCHETING, a form of hand knitting in which cloth is made from a single thread worked with a single hooked needle. Although crocheting had long been used to make utilitarian articles, eighteenth century tambour work created an interest in it as fine handwork (see NEEDLEWORK). Crocheting has remained popular as a needlecraft because it can be adapted to the making of a wide variety of objects. For example, sheer lace doilies or heavy rugs can be made by varying the size of the needle and yarn.



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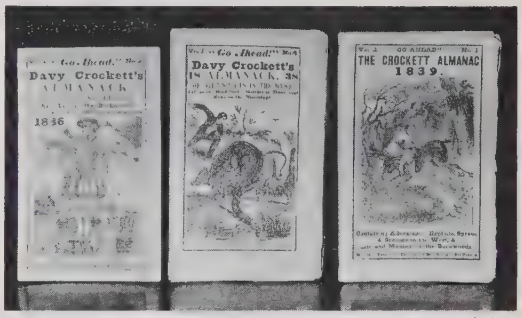
To make a foundation chain of 20 stitches for practice, begin the row by inserting hook from front under the two top threads of second chain (ch) from hook, upper left. Catch the thread with hook (thread over) and draw through stitch (st), upper right. There are now two loops on the hook, lower left. Next, thread over and draw through two loops (one loop remains on the hook). A single crochet is now completed, as in the illustration, lower right.

The chain stitch is the basic stitch. The hook is slipped through a loop of thread to catch the single thread being worked. The strand is then drawn through the first loop, forming a second loop. This process is continued until a chain of loops of desired length is made. As stitches are added to this basic chain, the design is formed by varying the number of loops and by joining loops at different intervals. When the loops are placed close together, a solid cloth results. By varying the number of loops and leaving spaces between a series of loops, lacy designs can be achieved. Yarns of different colors are often used to create designs. Such items as clothing for infants and children, sweaters, hats, belts, gloves, slippers, and pot holders are often crocheted. Lacy crochet designs are used for doilies, tablecloths, lace edgings, and place mats. See KNITTING.

CROCKETT, DAVID, 1786–1836, U.S. frontiersman, politician, soldier, and legendary hero, was born near what later became Rogersville, Hawkins County, Tenn. His brief schooling, ended when he ran away and wandered for a time, was resumed briefly upon his return. While still a boy he learned to farm and to hunt. He served under Andrew Jackson in the Creek War, 1813–14, and later held several local offices. Crockett was twice elected to the state legislature, and twice, 1827–31, 1833–35, to Congress. Newspapers of the day made much of his rough, homespun humor, and his motto, "Be sure you're right, then go ahead," was known everywhere. He toured the eastern states and everywhere was hailed by large crowds. A play about him, *Col. Nimrod Wildfire*, by Paulding, was a hit. Books about him—some by himself, some by others—swelled his fame. His autobiography, *A Narrative of the Life of David Crockett* (1834), a minor classic, tells in homely frontier style (somewhat polished by editing) the story of his adventurous life. After being defeated for Congress in 1835, Crockett went to Texas where he died in the battle of the Alamo, March 6, 1836.

ORIG. OWNED BY FRANKLIN J. MEINE

David Crockett

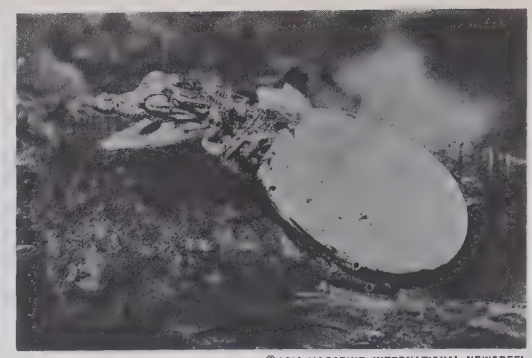
Crockett's heroic exploits stirred public interest in him, and more stories were published. Some of the most interesting were in a series of some 50 *Crockett Almanacs*, the first of which appeared in 1834, before his death, the last in 1856. Published first in Nashville, Tenn., later in Baltimore, Boston, Philadelphia, and New York, the *Almanacs*' jokes and tall tales lifted Davy to the status of a superhuman comic hero. Interest in Crockett was renewed in 1872 by Frank Hitchcock Murdock's *Davy Crockett*, with Frank Mayo as star of the play, which was successful for 24 years. In 1954, stimulated by television and motion picture versions of Crockett's life, interest in Crockett was revived; Davy became a "craze," though his popularity waned by the end of 1955. In his own day, down through the nineteenth century, and to some extent later, Crockett was admired not only as an adventurous frontiersman and patriot, but also as a "coonskin" philosopher—an uneducated man who figured out answers to problems because he was intelligent, had sound practical experience, and was able to express his ideas wittily. "One ounce of the genuine horse sense is worth a pound of your book learning any day," he wrote on one occasion. In addition, Americans consistently found memorable the imaginative and amusing tall tales which clustered about him. These showed Crockett as a comic demigod who knocked raccoons out of trees just by grinning at them, who rode to Washington on a pet alligator followed by a pet bear, and who on one occasion, when the sun "friz" on its axis, got the thing going again for the benefit of his countrymen. WALTER BLAIR

GROLIER CLUB

The Davy Crockett almanacs helped the famed frontiersman to become a legend in his own time. They were published in large numbers from 1834 to 1856 and widely distributed.

CROCKETT, city, SE Texas, county seat of Houston County; on the Missouri Pacific Railroad and U.S. Highway 287; 105 miles N of Houston. Crockett was settled about 1830 and was incorporated in 1837. The settlement was named for Davy Crockett, who may have camped here on his way to the Alamo. Cottonseed oil and lumber products are produced here. It is the seat of Mary Allen College. Pop. (1950) 5932.

CROCODILE, a reptile belonging to the order Crocodilia, which also includes the alligators, caimans, and gavials (see REPTILE). Crocodilians are the largest living reptiles, with individuals sometimes attaining lengths of 25 feet. Some authorities place several families in the order Crocodilia, others place all the species in the family *Crocodilidae*. Living crocodilians, which closely resemble their Triassic fossil relatives in structure (see GEOLOGIC TIME), are much alike in habit. When swimming the crocodile is propelled by its long, muscular tail, and in the water

Hatched at a Java laboratory under artificial conditions, an infant crocodile begins to break the shell of the egg.



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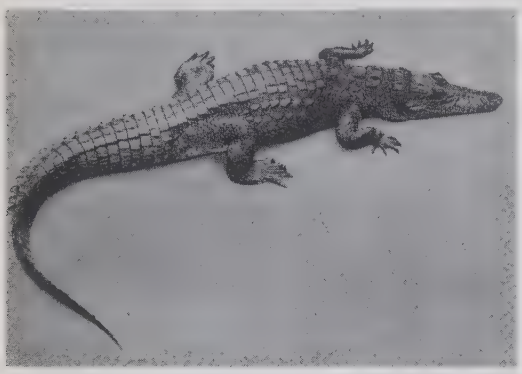
Another vigorous push and the young reptile, common in the East Indies, emerges with gaping jaws into a new world.



NEW YORK ZOOLOGICAL SOCIETY

Nile Crocodile

resembles a floating log. In order to breathe the animal must keep the tip of its snout above the surface. Crocodiles have two pairs of limbs that end in clawed toes connected by webbing; horny scales cover the body. The quadrate bone of the skull is fixed and the ears are small and covered by a flap. Teeth, modified for the animal's carnivorous diet, grow from individual sockets in the upper and lower jaws. Unlike those of the alligator, the two teeth in the fourth position in the crocodile are visible outside the closed jaw, giving the appearance of a smile. In alligators these teeth fit into sockets in the upper jawbone (see ALLIGATOR). The heart is four-chambered, but the blood is not pure, that is, the arteries contain a mixture of oxygenated and nonoxygenated blood. Crocodiles occur on all continents except Europe and Antarctica. The American crocodile, *Crocodylus acutus*, is found in southern Florida.

CROCODILE BIRD, a black-backed bird related to the plovers and belonging to the order Charadriiformes (see PLOVER). The crocodile bird, *Pluvianus aegyptius*, is native to Africa, ranging from the Sudan to Sierra Leone. The common name is derived from the bird's reputed association with the African crocodile, a reptile living in muddy streams and swamps that are also inhabited by bloodsucking leeches. The old, but unsubstantiated, story is that when the crocodile feeds, the leeches enter its mouth and attach themselves to the gums, particularly between the teeth. In order to remove the leeches, the crocodile allows the bird to enter its mouth and feed upon the parasites. Crocodile birds prefer life on the ground, and when alarmed seek to hide in shallow holes rather than take to flight immediately. They lay two to four eggs in the sand, covering them with a layer of sand or other material.

CROCODILE RIVER. See LIMPOPO RIVER.

CROCOITE, a rare mineral of no commercial importance, but noted chiefly for the fact that the element chromium was first isolated from crocoite ore. The chemical formula is $PbCrO_4$, lead chromate. It crystallizes in the monoclinic system (see CRYSTALLOGRAPHY). The mineral is recognized by prismatic crystals, a characteristic color and high luster, a high specific gravity of 5.9 to 6.1, and a hardness of 2.5 to 3 (see HARDNESS). Crocoite is bright red with orange to yellow streaks. It has been found in Rumania, the Ural Mountains, Tasmania, and in the Vulture district of Arizona.

CROCUS, a genus of hardy herbs belonging to the iris family, *Iridaceae*. These stemless plants have grass-like leaves that arise directly from the corm, or bulb. The white, yellow, or lilac flowers are funnel shaped and rise above the ground on a slender, tubelike perianth (see PERIANTH; FLOWER). The blossoms are composed of six equal or nearly equal segments. There are three stamens, shorter than the segments, attached in the throat of the perianth.

L. W. BROWNELL

Crocus in Bloom in Early Spring

Crocuses bloom in autumn or spring, the earliest sometimes appearing through the snow. The saffron crocus, *Crocus sativus*, is native to Asia Minor. Its lilac or white flowers may be 2 inches long. Its orange-colored stigma, when collected and dried, constitutes the saffron of commerce. See STIGMA; SAFFRON.

CROESUS, last king (560–546 B.C.) of Lydia. Having succeeded his father Alyattes, Croesus found it easy to subjugate the Aeolians, the Dorians, and the Ionians, who had been quarreling among themselves. Croesus extended his rule over most of Asia Minor west of the Halys River (later Kizil Irmak). Through mining and trade and through tributes exacted from conquered peoples, Croesus accumulated great wealth. A patron of the arts, Croesus was visited by Solon, whose interview with him is described by Herodotus. Croesus had great reverence for the oracle of Delphi, who is said to have told Croesus that if he crossed the Halys he would destroy a great empire. The empire Croesus destroyed was his own. Confronted by the growing power of Cyrus, king of Persia, Croesus invaded Cappadocia and fought an indecisive battle at Pteria. Returning to his capital city of Sardis, Croesus was pursued by Cyrus, who defeated him, 546 B.C.

CROGHAN, GEORGE, 1718?–82, American frontiersman, was born in Ireland. He migrated to Pennsylvania in 1741, settled near Carlisle, and established trading posts throughout the upper Ohio region. As Sir William Johnson's deputy chief of Indian affairs, 1756–72, he negotiated with tribes in

the Ohio Valley and was sent to open the Illinois country to English occupation. He later became a big landowner, but was ruined by the Revolution when unjustly accused of being a Tory. His journals and correspondence are valuable sources on the history of the time.

CROIX DE GUERRE, or Cross of War, a French medal granted for individual acts of bravery in wartime. As established in 1915 the medal was a bronze cross with two swords crossed behind it, with "République Française" on one side and the dates of World War I (1914–18) on the reverse side. The ribbon is green with borders and vertical stripes in red. Variations were introduced for the different orders of the medal, and for the Croix de Guerre granted in 1939 by the Vichy regime and by the French in North Africa in 1943. There is also a Belgian *Croix de Guerre*. See Decoration.

SMITHSONIAN INST.
French Croix de Guerre

CROKER, JOHN WILSON, 1780–1857, British Tory leader and essayist, was born in Galway, Ireland. Elected to parliament in 1807, he served with distinction as secretary to the admiralty, 1810–30. Adamantly opposed to the Reform Bill, he resigned from the House of Commons when the bill was passed, 1832. Croker caused a literary storm when he published in the *Quarterly Review* a venomous attack on John Keats' *Endymion* (1818). He edited (1831) James Boswell's *Life of Johnson* (1791), for which he was severely criticized by Thomas Macaulay. Croker in turn attacked Macaulay's *History of England* (first two volumes, 1848). He also wrote *Essays on the Early Period of the French Revolution* (1857). Disraeli drew a most unflattering portrait of Croker as Rigby in *Coningsby*.

CROKER, RICHARD, 1841–1922, known as "Boss Croker," U.S. political figure, was born in Ireland. He was brought by his parents to New York City, 1844, where he was identified with Tammany Hall politics after 1862. Elected alderman, 1868, he became the chief political lieutenant of John Kelly when Kelly succeeded William M. Tweed as head of Tammany Hall in 1871. Croker was coroner, 1873–79, and fire commissioner, 1883. After Kelly's death, 1886, Croker became the leader of Tammany and the Democratic boss of New York City. Three mayors were elected under his leadership. In 1899, after Robert A. Van Wyck had been elected first mayor of Greater New York, 1897, Croker admitted to a legislative committee that officials in the Van Wyck administration had been of his choosing and that he had been "working for his own pocket." His power was broken in 1901 when Seth Low, a fusion candidate, was elected. Croker retired to England in 1903 and later lived in Ireland.

CROKER, THOMAS CROFTON, 1798–1854, Irish antiquary, was born in Cork. He was known principally for such collections of songs and legends as *The Fairy Legends and Traditions of the South of Ireland* (1825), *Legends of the Lakes* (1829), and *Popular Songs of Ireland* (1839). Croker was a founder of the British Archaeological Association.

CRO-MAGNON MAN lived in Europe during the period known as the Paleolithic, or Old Stone Age. At that time *Homo sapiens* had definitely appeared. Cro-Magnon men are generally described as tall and erect, with high, long, narrow heads, large narrow noses, and projecting chins; however, the description does not cover all of the *Homo sapiens* physical types of that period. Another grouping known as Combe Chapelle-Brünn, while related to Cro-Magnon, shows narrow heads and faces and more pronounced eyebrow ridges. The discovery in Italy of two skeletons, known as Grimaldi, indicated the existence during that time of a Negroid stock. See Stone Age.

Cro-Magnon people were cave dwellers, but their material culture was far in advance of that of the Neanderthalers who preceded them. Although the Cro-Magnon men made extensive use of bladelike flakes of flint, their highest development of tools was in bone, including spear throwers and harpoons. Their greatest known accomplishment was in art. They carved and painted on the walls of their caves very realistic likenesses of the animals whose bones are found around their hearths. It is thought the art may have been connected with magical rites calculated to make game more plentiful. Etchings and carvings of pregnant women suggest fertility rites. The Cro-Magnon belief in an afterlife is indicated by offerings placed with the dead and the application of red ochre to the corpses. See Anthropology; Cave Art; Cave Man; Neanderthal Man; Grimaldi Skeletons. Fay-Cooper Cole

CROMARTYSHIRE. See Ross and Cromarty.

CROME, JOHN, 1768–1821, English landscape painter called "Old Crome" (to distinguish him from his son, John Bernay Crome), was born in Norwich. Crome's painting owes much to his study of the Dutch naturalists, Hobbema in particular, but his indefatigable observations of nature led him early to a personal style of rare sincerity and honesty. His Norwich landscapes, combining the minute, accurate detail of the Dutch school and his own vigorous, earthy conception were never far-off, beautiful places. They were very definite spots, each with its own physiognomy, each characterized by a largeness of conception and subtlety of color rarely seen in paintings of that time. Crome's studio became a gathering place for artists, and in 1805 he founded the Norwich School, a modest enough academy, but one of the few off the beaten path (both in location and in aesthetic philosophy). Although many of Crome's paintings were exhibited at the Royal Academy during his lifetime, he sold his works for very small sums and died, as he had been born, a rural townsman. *Mousehold Heath, near Norwich* and *The Willow* are examples of his style.

CROMER, EVELYN BARING, 1st EARL, 1841–1917, British diplomat and administrator, was born at Cromer Hall, Norfolk. With Egypt on the verge of bankruptcy, Cromer was appointed commissioner of the Egyptian public debt, 1877. His work was so outstanding that in 1879 he was appointed controller general of Egyptian finances. He was finance minister of India, 1880–83. Returning to Egypt as British agent and consul general, 1883, he became a virtual viceroy—backed by the power of the British army of occupation. Cromer's work in Egypt was to stamp him the "Maker of Modern Egypt." He fostered government stability by installing honest and able officials, reduced taxes, reorganized the Egyptian army, increased trade, and made improvements in public works and communication facilities. Cromer wrote *Modern Egypt* (1908) and *Ancient and Modern Imperialism* (1910).

CROMLECH, a class of stone monuments found principally in the British Isles, Asia, Europe, and America, where the practice of raising commemorative monuments of stone may be traced to ancient times. The name is derived from the Gaelic *crom*, meaning crooked, and *laec*, a flagstone. A cromlech is an arrangement of rude monoliths, placed at intervals of a few yards, to form a circular, oval, or rectangular enclosure. It is probable that cromlechs were used in religious ceremonies and for the interment of the dead. See Dolmen.

CROMPTON, SAMUEL, 1753–1827, English inventor of the spinning mule, was born in Firwood. The son of cottage weavers, Crompton was early

pressed into spinning and weaving; annoyed with imperfections in Hargreaves' spinning jenny, which caused thread to break easily, he set about devising a remedy. In 1779 he perfected a machine which combined features of Arkwright's frame and Hargreaves' jenny, and added a new spindle carriage to ease the strain of winding, which made possible the production of finer cotton. Too poor to patent his invention, Crompton sold his rights for very little money. In 1812, however, parliament granted the inventor £5000 in recognition of the role the spinning mule had played in the establishment of the British muslin trade.

CROMWELL, OLIVER, "The Protector," 1599–1658, English political and military leader, was born in Huntingdon. He was the second son of Robert Cromwell, whose grandfather Richard Williams had taken the name of his patron, Thomas Cromwell, Earl of Essex. From the Huntingdon free-school, where he was a mediocre student, Oliver Cromwell was sent to Sidney-Sussex College, Cambridge, in 1616, where he spent more time amusing himself in field exercises than in classroom work. Despite this fact, contemporaries such as Edmund Fuller testified that during this period Cromwell was well read and cultured. Upon the death of his father in 1619, young Cromwell went to London supposedly with intention to study law; he probably did not do so, however, since his name does not appear on the books of any of the Inns of Court. He led what has been described as a profligate life until 1620, when he married Elizabeth Bourchier, daughter of a London merchant. Returning to Huntingdon, he assumed the management of the parental estate, and interested himself enough in English Puritanism to make his home something of an asylum for displaced clergymen. In 1628 he sat for Huntingdon in the third parliament of Charles I, distinguishing himself by his defense of Puritanism in violent, if somewhat heavy-handed, oratory, coupled with determined, common-sense committee work. His support of Puritan ministers exacted a grim toll from his purse, however, and he was forced by financial need to take a farm at St. Ives, 1631; on the death of an uncle in 1636 he became the farmer of the cathedral tithes at Ely. It was during this period of straitened finances that a change took place in Cromwell's religious feelings. Previously, he had been moderately interested in Puritanism as against what he termed "Romanizing"; but by 1638, in his own words, he was "given to see the light." In 1640 he sat for the town of Cambridge in both the long and short parliaments, becoming intimate with the radical party. Active in committee work and on the floor, he began to reveal himself as not merely a violent speaker, but a persuasive one as well.

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Oliver Cromwell

Civil War. When civil war broke out in 1642, Cromwell organized his district for the parliamentary cause, and as a captain fought in the regiment of Essex at the battle of Edgehill. Within the next year he did much to reorganize the parliamentary army, making it into a rigidly disciplined, scrupulously moralistic, yet enthusiastic body. While the parliamentary cause was failing in other sections of the country, the eastern counties, formed into an association and inspired by Cromwell's constancy and courage, remained firm. At the battle of Marston Moor, 1644, Cromwell saved the day by a vigorous and well-timed cavalry charge. As leader of the Independent party in Manchester's parliamentary army, Cromwell struggled for control with the Presbyterian faction until, disgusted with what he considered Manchester's lack of zeal, Cromwell laid charges against the commander before the House of Commons. The House of Lords retaliated by conducting an investigation into incendiary statements allegedly made by Cromwell. In the midst of this battle between the houses of parliament, Cromwell changed his tack by reducing the charges against Manchester, attributing the movement's lack of success to inadequacies in the parliamentary army. By this maneuver he succeeded in putting through his plan for a new model army and, in addition, the Self-denying ordinance which provided that members of neither house of parliament could hold army commands. By this rule Cromwell himself should have been removed from army command, but, after extending his commission several times, both houses came to agree that they could not do without his military services. It was the New Model army which Cromwell, under Sir Thomas Fairfax, led to victory at Naseby, 1645, and with which, in his contest with the Presbyterian parliament, he marched on London in 1647. Cromwell brought Charles I to trial, signed his death warrant in 1649, and formed the Commonwealth; by 1651 (Battle of Worcester) the fighting had ended.

The Great Protector. As Protector, Cromwell dissolved the left-over "rump" parliament (Long Parliament) and selected his own parliament, which offered him the title of king. This he refused, accepting in its stead the power to name his successor and to fix revenues. His hand-picked parliaments, having proved intractable, were soon dissolved, and power reverted to Cromwell and his army. The period of his rule was one of constant struggle with republican resistance and royalist uprisings, the latter fomented by Charles II, who was considered by many Englishmen as the country's rightful ruler. Despite such civil disorder, Cromwell, although widely considered a regicide and usurper, was a competent administrator. He reorganized the national church on a principle of comprehension, curbed the persecutory tendencies of parliament, gave parliamentary representation to Scotland and Ireland, and supported the universities. Under his leadership England became the Protestant leader of Europe, expanded her territories, and increased her commerce. His "court" was frugal but dignified, despite its coarseness. On Cromwell's death, his carefully constructed Commonwealth crumbled for lack of effective leadership. The Restoration in 1660 came as a relief to many Englishmen, who longed for surcease from the compulsive "purity" of the Commonwealth. Nevertheless, Cromwell is regarded as one of England's greatest statesmen, and he made a lasting impression on English life. See CHARLES I; CHARLES II; ENGLAND, History; RESTORATION. RACHEL GILBREATH

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CROMWELL, RICHARD, 1626–1712, son of the great Protector, Oliver Cromwell, succeeded his father as Lord Protector, but inherited little except the office: he had neither the energy nor the ability of his father. He resigned in 1659, and after the Restoration in 1660 lived abroad.

CROMWELL, THOMAS, EARL OF ESSEX, 1485–?1540, English statesman, the son of Walter Cromwell Smyth, a brewer, was born in Putney. He left home at an early age and was at various times a sailor, merchant, lawyer, and moneylender, in which capacity, probably, he came to the attention of Cardinal Wolsey, who used him as a revenue collector. Wolsey later helped him enter parliament, 1524, and

made Cromwell his confidential secretary. After Wolsey's disgrace and fall, Cromwell put himself in the good graces of Henry VIII by his adroit management of parliament in Henry's divorce action against Catherine of Aragon. From then on his political rise was rapid: in 1535 he was appointed visitor-general of monasteries and was the chief agent in suppressing them and confiscating their lands; in 1536 he was knighted and created lord privy seal and vice-regent of the king in spiritual matters and much of the confiscated land was added to his holdings. Cromwell, thoroughly devoted to the principle of the supremacy of the monarchy over the church in affairs of government, has been called the prime mover of the English Reformation. This is probably an overstatement, but he was certainly one of its most forceful proponents. He was ruthless in dealing with opposition using (it has been said) the ax more readily than the pen, and has also been accused of opportunism in using Protestantism as a tool in the attainment of absolute monarchy. Having thoroughly antagonized the clergy in his capacity as spiritual vice-regent and, as lord great chamberlain, having earned the disfavor of the Lords, and having negotiated the marriage of Henry to Anne of Cleves (whom Henry detested on sight), Cromwell found himself in a rather shaky position when his proposed alliance with the North German princes against Charles V failed. The Duke of Norfolk, his avowed enemy, lost no time in bringing charges of treason against the recently created Earl of Essex, and the clergy quickly followed suit with charges of heresy; the very fact of these charges, of course, assumed that Henry had thrown Cromwell to the wolves. An act of attainder was passed against him and he was sent to the Tower. After repudiating all heresy and declaring that he wished to die in the Catholic faith, he was beheaded.

CRONIN, ARCHIBALD JOSEPH, 1896– , Scottish novelist and physician, was born in Cardross, Dumbartonshire, and studied medicine at the University of Glasgow. He built up a lucrative practice, but abandoned it for literature upon the success of his first novel, *Hatter's Castle* (1931). Doctors were the protagonists in his novels *The Stars Look Down* (1935) and *The Citadel* (1936), and in his play *Jupiter Laughs* (1940). His other works include *The Keys of the Kingdom* (1941), *The Green Years* (1944), *The Spanish Gardener* (1950), an autobiography, *Journey of Discovery* (1952), and *Beyond This Place* (1953).

CRONJE, PIET ARNOLDUS, 1835?–1911, Boer general, was born in the Transvaal. In the Boer War, as commander of the western army of the South African Republic after 1899, he laid siege to Kimberley, repulsed the British at the Modder River and at Magersfontein. But when British forces relieved Kimberley, Cronje was forced to retreat near Paardeberg. After holding out for eight days, he surrendered with the remnant of his army.

CRONUS, identified by the Romans with their god Saturn; in Greek mythology he was the ruler of the gods before Zeus. He was the youngest of the Titans, and the son of Uranus (Heaven) and Ge (Earth); and was the father, by Rhea, of Hestia, Demeter (Ceres), Hera (Juno), Hades (Pluto), Poseidon (Neptunus), and of Zeus (Jupiter). He expelled his father Uranus from the throne of heaven, and was in his turn dispossessed by Zeus.

CROOKES, SIR WILLIAM, 1832–1919, English chemist and physicist, was born in London and studied at the Royal College of Chemistry. He became meteorological director of the Radcliffe Observatory, 1854, and taught there for a time, but soon began research in his own laboratory in London. In the course of an investigation of sulfuric acid residues he discovered the element thallium, 1861; further study of the element led him to research in radiant matter and the invention of the radiometer, 1875–77. In later experiments with radiant matter Crookes invented the cathode-ray tube, a high-vacuum glass tube which, when electrically charged, emitted cathode rays. The tube itself was an important step toward the development of incandescent lighting and the X-ray tube. In 1881 Crookes also developed a new method of spectrum analysis. He became interested in the problem of protecting the eyes of glass workers from cataracts caused by intense heat radiation from molten glass, and as a result developed a special tinted glass which, when worn (in spectacles) by the workers, offered material protection. Crookes also did important research in the rare earths, diamonds, and rarefied gases. In recognition of his many services and discoveries he was knighted, 1897, and received the Order of Merit, 1910. He founded and was sole editor of *Chemical News*, 1859–1906, edited the *Quarterly Journal of Science* after 1864, and published numerous scientific papers, among them *Select Methods in Chemical Analysis* (1871).

CROOKES TUBE. See X Ray, *X-Ray Tubes*.

CROOKSTON, city, NW Minnesota, county seat of Polk County; on the Red Lake River; the Great Northern and Northern Pacific railroads; and U.S. highways 2 and 75; it is 63 miles NNE of Fargo, N.D. Located in a rich farming area, Crookston is a trade center for the area and produces flour, feed, monuments, and dairy and wood products. The Northwest School and Experiment Station, branches of the University of Minnesota, are located in Crookston. The area was settled in 1872, and the city was incorporated in 1879 and named for an early railroad official, Col. William Crooks. The mayor-council form of government was adopted in 1947. Pop. (1950) 7352.

CROP, the produce or harvest of agricultural cultivation. For accounts of the various crops, see individual articles; Agriculture.

CROP AND LIVESTOCK REPORTING, the collection and publication of estimates and forecasts of production, and stocks and prices of agricultural products. The Agricultural Estimates Division of the U.S. Department of Agriculture issues statistical reports throughout the year for the various crops and for classes of livestock. Such information is valuable because it insures fair competitive pricing of agricultural products and gives all buyers and sellers equal access to full information about the factors that influence the market. It helps the farmer and livestock producer in making decisions on planting, breeding, feeding, and marketing.

One of the first activities of the Department of Agriculture, crop reporting was begun in 1862 at the request of farmers to protect them from false and misleading reports issued by persons who wished to buy farm products at low prices for speculative purposes. Operating through the Crop Reporting Board, the Agricultural Estimates Division provides statistical reports for more than 150 farm products. The reports include estimates of the acreages of crops that farmers intend to plant, acres planted and acres harvested. Monthly estimates of production are issued during the growing season on the basis of crop conditions and probable yields per acre. Reports are issued each month on the condition of pastures and ranges by states. Statistics of the numbers and classes of livestock and poultry on farms on January 1 of each year are published. Estimates of the pig crop are made in June and December. Monthly reports are issued on the production of milk and eggs, and of chicks and turkey poults in commercial hatcheries. Other reports covering various farm products are made at regular intervals ranging from a week to a year; these are compiled on the basis of information gathered from hundreds of thousands of farmers and businessmen throughout the country. In 36 states the information is gathered jointly in co-operation with state agencies. Release of information from the Crop Reporting Board is strictly controlled to insure that no one can obtain advance knowledge of official crop estimates.

The U.S. Department of Agriculture has operated a market news service since 1915. It issues reports on prices, stocks, carloadings, livestock receipts, cold storage holdings, and other market data. The department also publishes an annual outlook report each fall and issues situation reports periodically.

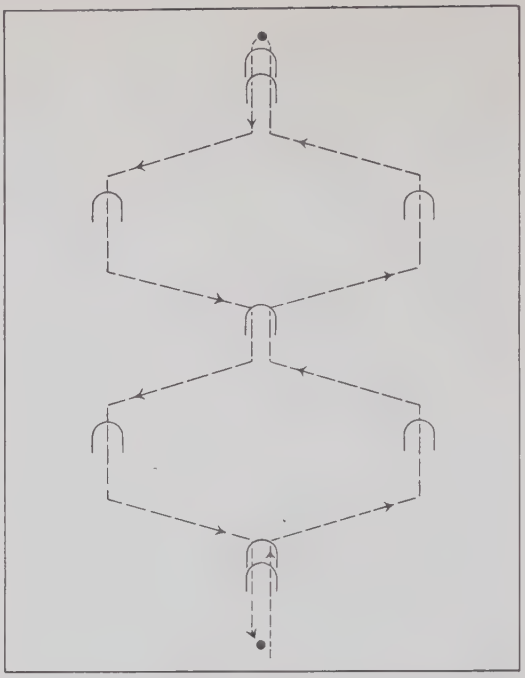
Many other countries maintain some type of official crop reporting service, and private reports are issued in the United States by grain and cotton organizations, newspapers, and other private agencies.

CROP INSURANCE, the insuring of farm crops against loss or damage occasioned by weather or pestilence. Insurance may be written against specific hazards or against all risks. In the United States all-risk insurance has been provided for some crops by the federal government through the Federal Crop Insurance Corporation since 1938.

History. An early experiment in crop insurance was undertaken by a Minneapolis fire insurance company in 1899 when it offered insurance against weather and pestilence hazards and price declines. The attempt resulted in large losses and was abandoned after one year. Attempts by two other companies in 1917 also failed. In 1920 the Hartford Fire Insurance Company offered to insure farmers their costs of production on the basis of a premium of 6 per cent, but this venture also resulted in such heavy losses that it was soon dropped. Since 1883 many companies have offered hail insurance for a wide range of crops with mixed results. Between 1911 and 1930 five states in the Great Plains area undertook to provide hail insurance, but only the programs in North Dakota, Colorado, and Montana were continued after the depression of the 1930s.

Federal Crop Insurance was initiated under the Agricultural Adjustment Act of 1938 which established the Federal Crop Insurance Corporation. From 1938 to 1941 the program covered only wheat and was on the basis of from 50 to 75 per cent of average yield. Cotton was added to the program in 1941. Congress suspended the crop insurance program in 1943 after both programs had shown continuous losses and low participation by farmers. The program was reactivated by Congress in 1944, and in 1945 insurance was offered for wheat, cotton, and flax on a nationwide basis and for corn and tobacco on a trial basis. In 1948–49 the entire program was put on an experimental basis and provision was made for multiple crop coverage and gradual widening of the program to cover other crops. Between 1950 and 1955 the crop insurance program covered an average of about 350,000 farmers with protection amounting to an average of over $300 million. The program continued to show losses, but these were mainly due to damages in certain counties where droughts were prolonged. Fourteen such counties in the Southwest were dropped from the program in 1956 in order to develop a sounder basis of operation.

CROQUET, a nonprofessional outdoor game played with balls and mallets on a grass or clay court of varying size, but usually about 40 by 60 feet. The game is believed to have originated in France in the seventeenth century and probably derived its name from the French *crochet*, meaning crooked stick. Later played in England as "pall mall," it died out in the 1700s, experienced a short revival about 1850, and was supplanted by tennis in the 1890s. Equipment consists of eight color-striped wooden balls 3¼ inches in diameter, eight mallets, two stakes, and nine or 10 wire wickets. Object of the game, which is played individually or by teams of two, three, or four players, is to make a complete circuit of the wickets, the winning side being the first to complete the circuit. Players alternate in shooting and each ball passing through a wicket gives its owner an additional shot. Hitting an opponent's ball gives a player two extra shots, one of which may be used to knock his rival's ball away; the player then remains "dead" on that ball until he has passed through the next wicket.



Typical layout of American lawn croquet playing area, with broken lines indicating course of ball. Variations of the game use two transverse or crossed wickets in the center.

After making the complete circuit, but before hitting the home stake, a player may become a rover and play on any ball, usually with the object of delaying opposing players' progress. See ROQUE.

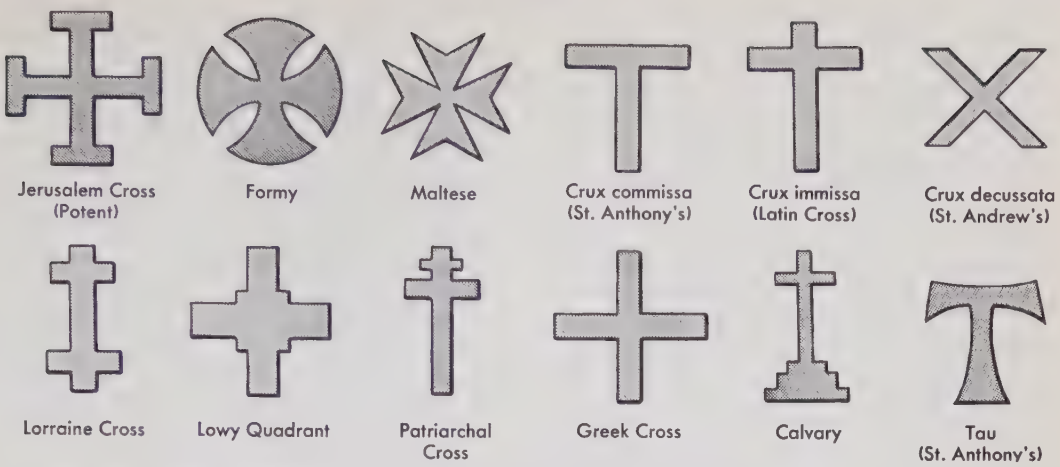
CROSBY, BING, real name Harry Lillis Crosby, 1904– , U.S. singer and motion picture actor, was born in Tacoma, Wash. He entered both the radio and motion picture fields in 1931, became famous as a singer, and amassed a large fortune. Crosby received the Motion Picture Academy Award, 1944, for his part in *Going My Way*. Appearing on television after 1952, he confined his shows to one each year after 1955. He wrote, with Pete Martin, *Call Me Lucky* (1953). His films include *The Bells of St. Mary's* (1945), *Welcome Stranger* (1947), *Riding High* (1950), and *The Country Girl* (1954).

CROSBY, FANNY, full name Frances Jane Crosby, 1820–1915, U.S. verse and hymn writer, was born in Putnam County, N.Y. Blind from infancy, she was educated at the New York Institute for the Blind, where she later taught until her marriage in 1858 to Alexander van Alstyne, a blind music teacher. She is said to have written nearly 8000 hymns, among them *Safe in the Arms of Jesus; Jesus, Keep Me Near the Cross;* and *I Am Thine, O Lord*. She also wrote *The Blind Girl, and Other Poems* (1844).

CROSBY, municipal borough, W England, SW Lancashire, on the Mersey River, 5 miles NNW of Liverpool. Crosby is primarily a residential area but has some industry, principally the manufacture of food products and metal goods. The municipal borough includes the towns of Great Crosby and Waterloo with Seaforth. Pop. (1951) 58,362.

CROSS, the intersection of two lines at right angles to each other, used as a religious symbol from the earliest days of antiquity, but most commonly associated in modern times with Christianity, of which it is the principal symbol.

Christian Usages. Crucifixion was a common method of punishment and execution for many pre-Christian peoples, and continued to be used after the advent of Christianity (see CRUCIFIXION). After the Crucifixion of Christ, the cross came to symbolize



The Cross, symbol of Christianity, is used in a great number of different forms as an organizational emblem.

triumph over death and, more generally, triumph over all worldly things. The apostle Paul was instrumental in making Christianity "cross-centered." The practice of crucifixion was formally ended among the Romans by Constantine the Great, who made Christianity the official religion of the Roman Empire. According to tradition Helena, the mother of Constantine, discovered the true cross of Christ in 326. Part of this cross was deposited in a chest by Constantine and was preserved thereafter in Rome; other portions were distributed throughout Christendom. The tradition of "The Invention of the Holy Cross" by Helena conflicts with a still older tradition, according to which the true cross was found during the reign of Tiberius. An attempt during the nineteenth century to reconcile the two legends (by terming Helena's discovery a "rediscovery") was unconvincing to most scholars. Relics claimed to be from the true cross are found today in all parts of the world. Large and important relics are found in the Basilica of the Holy Cross in Rome and in Notre Dame, Paris.

During the medieval times and before, the influence of the cross upon life and thought was most pervasive: churches were normally built according to a cruciform plan (see CHURCH ARCHITECTURE); alleged relics of the true cross were common currency in the market place; the cross was perhaps the most used figure in heraldry; the sign of the cross was a part of the Christian ritual, and became almost commonplace in the everyday life of the people. The true cross was said to have been made of four kinds of wood (palm, cedar, olive, and cypress); to its four arms were ascribed many symbolical meanings, such as the four quarters of the world. In this light the cross influenced the form of the literature (theological and otherwise) of the period almost as much as did the idea of the Trinity.

In the course of time the basic design of the cross (two lines intersecting at right angles) was varied and elaborated in many ways, some of them harking back to pagan usages. The craftsmen who made crosses for liturgical and other purposes sometimes embellished the basic design to such a degree that it was hard to recognize the cross as such. The liturgical cross discovered in 1940 during excavations at Herculaneum at the foot of Mount Vesuvius is probably the oldest in existence. This city was wiped out by the eruption of Vesuvius at the same time as Pompeii, and liturgical crosses found in both cities date to the period before A.D. 79. Crosses uncovered in Pompeii apparently were scurrilized with obscenities, a fact which indicates that those who hated the Christians saw the cross as a Christian symbol even at this early date. It is a tribute to the vigor of the religion which the cross came to symbolize that through 2000 years the cross came to mean one thing first of all, despite the ambiguity of its pagan origins and its variety of non-Christian uses.

Non-Christian Usages. A variety of meanings were attributed to the cross in antiquity. Among the Carthaginians and Phoenicians it was used as an instrument of sacrifice to Baal. The Persians considered it a charm against evil and death. To the Gauls it was a solar symbol endowed with creative and fructifying powers. In Central and South America natives worshiped it as the emblem of the god of rain. It figured prominently in the observances of various phallic cults. It is clear from these examples that whether the cross signified *life* (fertility, rain, phalli-

Memorial and Monumental Crosses

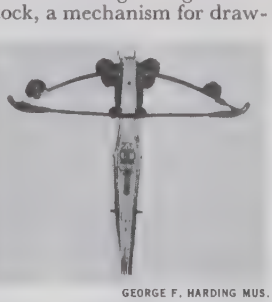
cism, and so on), or *death* (it was used as a means of killing by the Persians, the Assyrians, the Egyptians, the Greeks, the Romans, and the Jews), it was never neutral. The Christians appear to have been virtually unique in *combining* the two extremes of life and death. Jesus the Christ, although tortured and killed, emerged the victor, and the idea of a new life *through* death became central to Christianity: the cross came to symbolize this. Because the new conception was so much more comprehensive than those which had prevailed before, Christians were able to see the various pagan uses of the cross as signs or omens of the coming of Christ.

The cross has often been used symbolically for extrareligious purposes. Apart from such sporadic, transitory, or pagan aberrations as its use in the United States after the Civil War by the Ku Klux Klan (Knights of the Flaming Cross), and the use of the swastika (an ancient form of cross) by the National Socialists in Germany preceding and during World War II, such usages are almost invariably metaphorical. The "cross" in Red Cross, the cross symbolism of various fraternal organizations, and the appearance of various forms of cross in national flags (such as in Great Britain's Union Jack), all indicate an attempt to identify the user or his group with Christianity.

CROSSBILL, a perching bird belonging to the finch family, *Fringillidae*, and so named from the overlapping tips of its bill. Various species and subspecies of crossbills, genus *Loxia*, are recognized. The American crossbill, *L. curvirostra*, also known as the red crossbill or common crossbill, is about 6 inches long. The body is plump, the wings long and pointed, and the tail forked, short, and narrow. The males are reddish brown or bright red, the females olive gray. The crossbill feeds on seeds which it scoops from pine cones with its spoonlike tongue. In range, the crossbill is usually limited to coniferous forests from Alaska to Michigan. The white-winged crossbill, *L. leucoptera*, is rosy red, with a black tail and black wings marked with white bars. Its general range, behavior, and habits are similar to those of the American crossbill.

White-winged Crossbill

CROSSBOW, arbalest, or arbalist, a medieval weapon consisting of a bow set at right angles to a musket-shaped wooden stock, a mechanism for drawing back and holding the bowstring, and a trigger for releasing it. The stock was grooved to guide the arrow or bolt, which was propelled with great force. Although used by the ancient Romans as auxiliary weapons, crossbows were in use chiefly from the twelfth through the fourteenth centuries. The crossbow had many forms and, as the bows were strengthened, many devices employing levers, ratchets, and windlasses were used to draw back the bowstring and arrow. As crossbows became more powerful they became heavy and cumbersome. English archers preferred the longbow, which they could fire faster and with almost equally effective force. Crossbow arrows varied in length with the size of the crossbow; commonly they were 18 inches long. The ends were usually tipped with metal, square-headed or sharpened to a point. Crossbows used by Oriental nations were sometimes decorated with inlays of pearl, silver, and gold. Large military engines such as the ballista, used in the Middle Ages to hurl heavy stones, were based on the principle of the crossbow. See Bow and Arrow.



GEORGE F. HARDING MUS.

Crossbow

CROSS-COUNTRY, a foot race over a natural course which includes roads, ruts, ditches, streams, and even fences and gates. Marked by flags, arrows, or limed lines, cross-country courses vary in length from 3 to 7 miles except in high school races, which have a 3-mile maximum. Seven to eight men comprise a team, with only the first five finishers scoring points. One point is scored for first place, two for second place, and so on, with the winning team being that with the low aggregate score.

CROSSETT, town, SE Arkansas, Ashley County, on the Arkansas and Louisiana Missouri, the Ashley, Drew and Northern, the Rock Island, and the Missouri Pacific railroads and U.S. Highway 82; it is 75 miles S of Pine Bluff. The town was built and settled in 1901 by a lumber company that was a pioneer in scientific reforestation in the area. The town adopted a mayor-council form of government in 1902. Lumber, charcoal, chemicals, wood pulp, and cotton and paper bags are produced here. Pop. (1955 special census) 5172.

CROSS-EYE, an inward turning of either eye or both eyes, preventing focusing. See Strabismus.

CROSS KEYS, BATTLE OF, fought during the Civil War, on June 8, 1862, near Harrisonburg, Va. General Thomas J. "Stonewall" Jackson, the Confederate commander, was campaigning in the Shenandoah Valley to prevent the Union troops there from joining Gen. George B. McClellan in the assault on Richmond. At Cross Keys a Confederate force of about 6500 under Gen. Richard Ewell repulsed an attack by Gen. John C. Frémont's force of 12,000. The Union force lost 684 men and the Confederates 288. As a result of this campaign the planned juncture of Union forces was prevented; Jackson was able to join Lee in the defense of Richmond. See Shenandoah Valley Campaigns.

CROSS OF GOLD SPEECH. See Bryan, William Jennings.

CROSSOPTERYGII, a group of fishes known mostly from fossil remains, the oldest of which occur in Lower Devonian rocks deposited about 350 million years ago (see Geologic Time). Their most obvious distinguishing feature is in the fins, especially the paired fins, which are paddle-shaped with a muscular, scale-covered lobe at the base that permits great freedom of motion.

The more typical Crossopterygii, known as the order Rhipidistia, appeared in the Lower Devonian time and became extinct in the Permian, about 200 million years ago. Highly predaceous forms, they lived almost entirely in fresh water. They were moderate in size, although one species may have attained a length of several yards. In spite of their short history, the Rhipidistia are of importance because many features of their structure indicate that this was the group that gave rise in the late Devonian period to the first land vertebrates, the Amphibia (see Amphibia).

A second group of Crossopterygii, known as the order of Coelacanths, is distinguished by its stocky body, the shortened gape of the mouth, and the loss of the large lateral teeth and their supporting bones. The earliest forms from the Devonian period were marine. Later Paleozoic genera were fresh-water inhabitants; during the Mesozoic era they returned to the sea. The latest fossil coelacanths occur in Cretaceous rocks, 70 million years old, and for many years were thought to have become extinct at that time. In 1938, however, a living member of this group was caught off the east coast of South Africa and named *Latimeria*. Since 1952 several more specimens

CHICAGO NATURAL HIST. MUS.

The "living fossil" coelacanth, *Latimeria chalumnae*, dates back some 350 million years. Once thought to be extinct, coelacanths have been taken from waters off Madagascar.

of this genus were captured among the Comoro Islands, lying between Madagascar and East Africa. They are rather large fishes, reaching a length of 5½ feet and a weight of 180 pounds. They have large circular scales, and a steely blue-gray color. They have been captured at depths of 480 to 1200 feet and are believed to live on rocky bottoms where they prey on small fishes. The importance of *Latimeria* lies in the opportunity it offers to determine the structure of the soft parts of an extremely primitive vertebrate. The coelacanths, although they have had an unusually long history, have been very conservative in their evolution, changing little since their first appearance in the Devonian period. They are one of the best examples of "living fossils."

ROBERT H. DENISON

CROSS RIVER, SE Nigeria, rises in the S British Cameroons, about 30 miles ESE of Mamfe, flows W to the Eastern Provinces and then S to enter the Bight of Biafra through an irregularly shaped estuary. The river has a total length of approximately 300 miles and is navigable for most of its course.

CROSSWORD PUZZLE, a variety of word puzzle that first appeared in the *New York World* in 1913. Each puzzle usually consists of a large square marked off into a series of black and white squares to form a design. Numbered definitions for horizontal and vertical words correspond with the numbered white squares. The puzzle is solved by inserting in the white squares the letters of the defined word. A variation is a puzzle made up of all white unnumbered squares which the player must fill in from the definitions supplied, blacking out intervening squares.

CROTON AQUEDUCT. See AQUEDUCT.

CROTONE, port city, S Italy, in the region of Calabria, and the province of Catanzaro; on the Gulf of Taranto; it is 175 miles SE of Naples. Crotone has a cathedral, a museum of antiquities, and a castle built by Charles V. The city has a zinc smelter and chemical plants and manufactures agricultural machinery. Cereals, dairy products, olive oil, and livestock are processed. Sulfur is mined nearby. Crotone is located on the site of ancient Crotona, or Kroton, founded originally as a colony of Achaea in 710 B.C. In 510 B.C. it was subdued by the nearby city of Sybaris, captured by Agathocles of Syracuse in 299 B.C., and taken by the Romans in 277 B.C. The Greek philosopher and mathematician, Pythagoras, established a school here in 540 B.C. Milo, the famous athlete of the sixth century B.C., won many honors for Crotone in the Olympic games. The city was known as Cotrone from the Middle Ages until 1928. In World War II the city was bombed by the Allies who captured it in September 1943. Pop. (1954) 31,200.

CROTON OIL is a drastic cathartic obtained from the seed of the croton oil plant, *Croton tiglium*, native to southeastern Asia. The oil contains the exceedingly irritating croton resin. Tiny amounts of croton oil applied externally will cause blistering and peeling of the skin. Croton oil diluted in a suitable inactive vehicle was once used as a counterirritant. The action is so powerful, however, that the oil is deemed unsafe for use either as a cathartic or as a counterirritant.

CROTON-ON-HUDSON, town, SE New York, Westchester County; on the Hudson River, the New York Central Railroad, and U.S. Highway 9; 3 miles NNW of Ossining. The area was settled in 1609 and the town incorporated in 1898. Handbags and perfumes are manufactured. Pop. (1950) 4837.

CROTON RIVER, tributary of the Hudson River, New York, about 60 miles in length, rises in Dutchess County, follows a SW course through Westchester County, and joins the Hudson 30 miles N of New York City. The 294-foot New Croton Dam, completed in 1905, is the chief source of water supply for New York City. See AQUEDUCT; DAM.

CROUP. See SORE THROAT.

CROW, a tribe of Indians of Siouan stock, known in their own language as Absaroke, meaning crow people or sparrowhawk people. They were found living along the Yellowstone River and its tributaries, the Powder, Big Horn, and Wind, by Lewis and Clark; generally remained in that area in historic times; and were later established on a reservation along the Big Horn. Traditionally they separated from the Hidatsa near the beginning of the nineteenth century. Notable horse raiders, they fought against the Sioux and the Blackfeet and usually allied themselves with white people. Crow scouts accompanied U.S. troops in the Sioux War of 1876. Their number was estimated at 3500 in 1804, but since 1890 it has been approximately 2000.

CROW, any one of several large perching birds of the family *Corvidae* that includes the jays, ravens, and magpies (see JAY; RAVEN; MAGPIE). Both the genus *Corvus*, and the species *Corvus brachyrhynchos*, are called simply crow. Five subspecies or races of *C. brachyrhynchos* are recognized by North American ornithologists: southern crow, western crow, northwestern crow, eastern crow, and Florida crow. Crows are metallic black in color and range up to 19 inches in length, with a wingspan reaching 3 feet. They are regarded by many naturalists as the most intelligent of the birds. Fish, insects, mice, eggs of poultry and other birds, and seeds provide most of the food for crows, although more than 600 types of food have been noted. In some areas they are extremely destructive to crops because of their tendency to congregate in roosts numbering several thousand individuals. As a rule, crows inhabit wooded country, but some are found on bare moorlands. They nest in trees and lay four to six heavily stained and marked bluish green and olive-green eggs. The incubation period is about 18 days, with both male and female setting on the eggs and rearing the young. One brood a year is usual; however, in the southern states two broods are not exceptional. Natural life expectancy is about four years, but individuals in captivity have been known to live 20 years or more. Noted for its many and varied calls, the crow is an excellent imitator of other birds and especially of human laughter. Crows not found in North America include the hooded crow, *C. cornix;* the carrion crow, *C. corone;* the fish crow, *C. ossifragus;* the jabbering crow, *C. jamaicensis;* and the white-bellied crow, *C. scapulatus.*

Eastern Crow

CROW BLACKBIRD. See GRACKLE.

CROWD BEHAVIOR, the total conduct of a group of individuals acting together in some fashion. Much of the original insight into the nature and behavior of the crowd was provided by Gustave Le Bon, whose book, *The Crowd: A Study of the Popular Mind*, was published late in the nineteenth century.

Types of Crowds. Herbert Blumer, University of California sociologist, identified four types of crowds. The first, the *casual* crowd, such as persons watching a performer in a store window, is characterized by a momentary existence and loose organization. The *conventionalized* crowd is exemplified by a group of individuals at an exciting baseball game. Although its behavior is essentially like that of the casual crowd, its responses are expressed in established ways, such as cheering or booing. The *acting*, aggressive crowd is represented by a lynching or revolutionary mob. Its outstanding characteristic is the presence of an aim toward which its activity is directed. The fourth crowd classified by Blumer is the *expressive*, or "dancing," crowd, such as is common in the origin of religious sects or in the "swing" sessions of young people. With no outward goal, its impulses are spent in expressive actions, ordinarily in unrestrained physical movements which serve only to release tension.

Steps in Crowd Formation. The initial step in the formation of a crowd is the occurrence of some event which arouses interest and catches the attention of the people. The tension thus stirred up leads individuals to move around, talk with each other, and exchange their feelings of excitement, thus beginning the milling process. From this action comes the third step, the emergence of a common object of attention on which the feelings of the people become focused. The final step Blumer designates as the readiness to act on the objective. The action results from suggestion, imitation, and mutual acceptance of the goal.

Crowd Behavior and Social Change. Crowd behavior is one of the ways in which spontaneous groupings develop into organized forms of effort to effect social changes. The appearance of a new social order is, in other words, equivalent to the emergence of new forms of collective behavior, of which the crowd is an essential division. Sociologists point out that crowd or group activity means that individuals are acting together, that there is division of labor among them, and that there is some fitting together of different lines of individual conduct as the group moves toward realization of its goal. See SOCIAL PSYCHOLOGY.

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CROWDER, ENOCH HERBERT, 1859–1932, U.S. Army officer, was born in Edinburg, Mo. Educated at the U.S. Military Academy and the University of Missouri, Crowder fought in the Indian wars against Geronimo and Sitting Bull and was a military observer in the Russo-Japanese War, 1904–05. He was secretary of state and justice in Cuba, 1906–08, and became judge advocate general of the U.S. Army, 1911. As provost marshal general, 1917–19, he administered the Selective Service Act during World War I. Retiring from the army, he was the first U.S. ambassador to Cuba, 1923–27.

CROWFOOT. See BUTTERCUP.

CROWLEY, city, SW Louisiana, seat of Acadia Parish; on the Missouri Pacific and the Southern Pacific railroads and U.S. Highway 90; about 50 miles E of Lake Charles. Crowley is a principal center for processing, storing, and shipping rice. A federal-state rice experiment station is here. Machine-shop products, concrete blocks, sea food, and cotton are also processed. Oil was discovered nearby in 1902. The area was settled by Acadians in the 1880s and known as Houstch. It was incorporated as Crowley in 1888. Pop. (1950) 12,784.

CROWN, the symbol of sovereign authority in a state headed by a hereditary monarch. In Great Britain, "crown" stands for the sovereign in his corporate as opposed to his individual capacity (see CORPORATION). Theoretically, sovereignty is vested by the British constitution in the monarch, not in the people. All servants of the state—executive, administrative, military—are servants of the crown. The executive power is vested in the crown in council (the cabinet), the legislative power in the crown in parliament. The crown is represented in the courts by the judges, and abroad by the British diplomatic corps. British colonies that are governed from London are known as crown colonies, and all governmental activities are carried out in the name of the crown.

The principal prerogatives of the crown are to convoke and dissolve parliament; to select and dismiss ministers; to declare war and make treaties; to create peers; to appoint bishops of the Church of England, colonial governors, and judges; and to grant or refuse assent to the bills of parliament. But as the result of a long constitutional development, the crown may exercise these prerogatives only on the advice of the cabinet and with the consent of the parliament. Thus the person of the crown has been almost completely lifted out of the sphere of political decision. Yet certain constitutional conventions still provide the crown, in its individual capacity, the possibility of political influence. For the crown has the right to information about cabinet decisions and parliamentary proceedings; the right to communicate with, to warn, or to encourage its ministers; and the right to an explanation of actions for which the crown's assent is sought. The existence of these rights allows for any amount of royal influence which the cabinet, the parliament, and the people are prepared to tolerate. The extent of such influence depends also upon the personality and talent of the monarch, but the hereditary, symbolic, and social status of the crown enables it to exercise a unifying influence in cabinet counsel and to promote national unity and imperial interests in international affairs.

With the establishment of the British Commonwealth of Nations, the person of the crown remained the only unifying institution for the commonwealth countries.

CROWN, a special headdress symbolic of outstanding achievement or of royalty. Virtually all peoples, primitive or civilized, appear to have used crowns of one kind or another. In the ancient Mediterranean world, wreaths were worn by military and civic heroes, victors in athletic contests, participants in festive ceremonies, and, frequently, by brides. These uses of the crown persisted through the Middle Ages and even into the twentieth century. Thus the poet

WIDE WORLD

The legendary 900-year-old Crown of St. Stephen shown here was taken from Hungary by the Nazis during World War II and was later found by U.S. troops stationed in Germany.

Petrarch received a laurel wreath at Rome in 1341, and Britain still has its poet laureate.

The crown as the headgear of kings and emperors was known to antiquity. Egyptian Pharaohs wore striking and ornate head coverings, as did Assyrian and Persian kings, from whom Alexander the Great took his crown. The Roman emperors also wore crowns on occasion, but not until the latter days of the empire did the crown acquire the significance with which it was later endowed.

BRITISH INFORMATION SERVICES
British Imperial State Crown

Medieval and modern crowns are either "open" or "closed." The open crown is a band of gold, usually with its upper edge decorated with pointed projections. It is descended from the diadem borrowed by the Roman emperors from eastern royalty. The diadem was originally a band of silk or linen, sometimes decorated with precious stones. The closed crown also has a band of gold, but within the circlet an arch from the forehead to the back of the head intersects an arch from one side of the head to the other. The closed crown is apparently derived from a special type of helmet worn by the Emperor Constantine, 306–337.

A few European crowns of great antiquity were preserved. The iron crown of the Lombards is an open crown of six golden panels held together by a band of iron supposedly made from a nail of the true cross. It seemingly dates from the sixth century. From the medieval Holy Roman Empire there has survived a closed crown—the crown of Charlemagne—which scholars agree does not date from the time of Charlemagne but probably from the eleventh century. Of particular interest to Americans is the Hungarian crown of St. Stephen, since it fell into the hands of U.S. forces following the collapse of Nazi power in 1945. This is a closed crown; its outer circlet dates from the 1070s, while the inner arches, according to tradition, were taken from a crown presented around 1000 by Pope Sylvester II to St. Stephen. Scholars are skeptical of the tradition, but the inner crown as well as the outer one is of great antiquity.

WIDE WORLD
Papal Triple Crown

Other famous crowns are the papal tiara and the English crown of St. Edward. The former is a hive-shaped headdress, probably Persian in origin, girded with three crowns. The first crown appeared in the twelfth century; a second was added by Pope Boniface VIII (1294–1303); the third dates from the fourteenth century. The symbol of the pope's secular power, the tiara has no spiritual significance.

The crown of St. Edward is the official crown of England. A closed crown, made in 1661 for the coronation of Charles II, it is a replica of the earlier crown of St. Edward destroyed by Oliver Cromwell and the Puritans during the Commonwealth. At the coronation of Elizabeth II on June 2, 1953, the queen was first crowned with St. Edward's crown. It was shortly replaced, however, with a lighter but more magnificent crown made in 1838 for Queen Victoria. On state occasions, such as the opening of parliament, Elizabeth II's crown is the imperial state crown of Queen Victoria, rather than St. Edward's crown.

JOHN R. WILLIAMS

CROWN, an English silver coin worth five shillings. Originally it was a gold coin issued by Henry VIII in 1526 in imitation of the French *couronne*. Imprinted with a large crown, it was first struck by Philip VI in 1339. Similar coins were minted by several other countries. Silver crowns and half-crowns were first struck during the reign of Edward VI. Although minting of the crown was sometimes suspended and no crowns were minted between 1902 and 1927, limited quantities were struck after 1928.

CROWN COLONY, a British overseas dependency which possesses little or no self-government, as contrasted with the self-governing colonies, protectorates, and trusteeships. Crown colonies usually have few inhabitants of British descent and are more or less directly governed by the crown, either because they are considered incapable of self-government or are of special strategic importance to the British imperial defense, as is true of Gibraltar and Cyprus. There is little uniformity in their governmental structure: some crown colonies may have an elective unicameral legislature, others an elective lower chamber of legislature and an appointive upper chamber or a wholly appointive legislative council, and still others may have no legislature at all. There is a tendency for crown colonies gradually to acquire a greater voice in their government. See BRITISH COMMONWEALTH OF NATIONS.

CROWN GALL. See GALL, *Plant Galls*

CROWN POINT, city, NW Indiana, county seat of Lake County; on the Erie and the Pennsylvania railroads and U.S. Highway 231; 35 miles SE of Chicago. Monuments, signs, grinders, and leather goods are processed here. The city was founded in 1834 and was incorporated in 1869. Pop. (1955 special census) 7329.

CROWN POINT, town, NE New York, in Essex County; on the Delaware and Hudson Railroad; 92 miles NNE of Albany. In 1690 a scouting party from Albany erected a small stone outpost, "Little Stone Fort," on a promontory on the west shore of Lake Champlain just north of the present town. The French occupied the district in 1730 and a year later built Fort St. Frederic on the site. Several English expeditions were directed against the post, but it was not until 1759 that forces under Gen. Jeffrey Amherst were successful. The French commander blew up the fortifications and abandoned the area. The fort was rebuilt and named Fort Amherst, later Fort Crown Point. On May 12, 1775, Col. Seth Warner and the Green Mountain Boys captured the fort and its small garrison, just two days after the capture of Ticonderoga. The post was abandoned to General Burgoyne during the Saratoga campaign in 1777. The grounds and ruined fort were deeded to the state for a park in 1910. The town is a resort center. Pop. (1950) 1707. See GREEN MOUNTAIN BOYS; TICONDEROGA.

CROWN WHEEL, in machinery, a toothed wheel with the teeth set in its rim at right angles to its plane. It may be used as a gear, as a ratchet, or as an escapement wheel in a clock movement.

CROYDON, county borough, SE England, NE Surrey, 10 miles S of London, forming part of the S fringe of Greater London. Croydon is primarily a residential district although it has some industry. Leading manufactures include food products, machinery,

chemicals, metal goods, and leather. Croydon airport, of major importance before World War II, has been superseded largely by other airports in the London area. Features of interest in the borough include the fourteenth century palace of the Archbishops of Canterbury, now housing a school; several ancient churches; and an Elizabethan 1596 hospital building. The Croydon area was severely bombed during World War II. Pop. (1951) 249,592.

CROZET ISLANDS, small archipelago, forming a dependency of Madagascar, in the S Indian Ocean, about 1500 miles SSE of Madagascar; area 200 sq. mi.; uninhabited. The group is composed of several small islands, among them Possession, Apostle, Hog, Penguin, and East islands. They are volcanic in origin, rising several thousand feet in elevation, and are surrounded by numerous reefs that present a hazard to navigation. The islands were discovered in 1772 by the Frenchman Marion du Fresne.

CRUCIBLE PROCESS, a steelmaking process probably discovered in India in the fifth or sixth century B.C. Many of the fine swords made in ancient Damascus and in Toledo, Spain, were forged from crucible steel, but the process seems to have been lost in Europe during the Middle Ages. It was rediscovered in England in 1742 by Benjamin Huntsman, a clockmaker who was searching for a uniform spring steel. He selected bars of cementation steel that, when combined, would give the exact carbon content he wanted (see CEMENTATION). These he broke into small pieces and charged into a clay pot called a crucible, which he heated until the steel melted.The slag was then skimmed off and the molten metal was poured into ingot molds; the result was a uniform steel much superior to cementation steel for springs, cutlery, and tools.

Later manufacturers varied the process somewhat, but the basic operations remained the same. Some charged the crucibles with wrought iron and charcoal, eliminating the cementation step. Capacity of the crucibles usually ranged between 80 and 124 pounds. The crucible process was the leading source of fine steel until the twentieth century, when it was practically superseded by the faster and cheaper electric furnace processes. See STEEL, *Steelmaking Processes*.

CRUCIFERAE, the mustard family of plants, is characterized by four-petaled, cross-shaped flowers. The *Cruciferae* include about 1600 species that are distributed throughout the cold and temperate zones of the world; they are especially abundant in the Mediterranean area. Many common plants are crucifers. Some, such as shepherd's purse and wild mustard, are weeds; others such as turnips, cabbages, radishes, and cress are cultivated as vegetables. Flower gardens often contain such crucifers as stocks, sweet alyssums, and wallflowers. Candytuft is popular with florists; rock cress and aubrietia are used in rock gardens. Most crucifers contain an oily substance that is pungent to the taste and so gives the various cresses their flavor. Because of antiscorbutic properties, water cress and scurvy grass have become useful food items.

CHICAGO NATURAL HIST. MUS.

Wild Cabbage Plant

The original rose of Jericho, one of the so-called resurrection plants, belongs to this family of crucifers (see ROSE OF JERICHO). The important forage crop, rape, is also a crucifer. Included among the important genera of the *Cruciferae* are *Arabis*, *Cardamine*, *Brassica*, *Dentaria*, and *Raphanus*. See ARABIS; BRASSICA; CARDAMINE; CABBAGE; CRESS; RADISH; RAPE; TURNIP; ALYSSUM; CANDYTUFT; WALLFLOWER.

CRUCIFIX, a representation of Christ on the cross, a widespread symbol of faith and devotion. In the Roman Catholic church the figure is attached to the cross but in the Eastern church it usually is painted. At first Christ was shown alive, clothed and crowned, but after the twelfth century the figure was usually represented in death, clad only in a waist cloth. Many great artists have devoted themselves to the carving of crucifixes. See CROSS; CRUCIFIXION.

WALTERS ART GALLERY

Delacroix' *Christ on the Cross* is one of the best-known nineteenth century paintings of the crucifixion, since the Renaissance a popular theme among the great masters of art.

CRUCIFIXION, a form of punishment in which the condemned person was fastened to a cross to die of exposure and exhaustion. It meant many hours of intense suffering and torture. First used by various eastern peoples, it was adopted by Rome as a death of shame from which Roman citizens were exempted. The Jews used it only after they came under Roman rule. It was finally abolished by Emperor Constantine after the Romans had employed it in persecuting the Christians.

Specifically, crucifixion refers to the death of Jesus Christ on the cross by order of the Roman governor Pontius Pilate at the demand of the Jewish leaders. The place was Golgotha (Calvary), just outside Jerusalem, where Jesus was crucified between two thieves. He went to His death willingly but not without an inner struggle, as shown in his prayer in Gethsemane). His spirit of love, faith, and devotion is reflected in the Seven Last Words: "Father, forgive them; for they know not what they do"; "Verily, I say unto thee, Today shalt thou be with me in paradise" (spoken to the repentant thief at his side); "Woman, behold thy son! . . . Behold thy mother" (to his mother and to John); "My God, my God, why hast thou forsaken me?"; "I thirst"; "It is finished"; "Father, into thy hands I commend my spirit."

These words reflect struggle and suffering, supreme trust in God, utter obedience to Him, and sacrificial love for others.

The crucifixion challenged the faith of the disciples. "We trusted that it had been he which should have redeemed Israel" expressed their first reaction; if He were truly the Messiah, Son of God, hope of the world, how could God have allowed His death at the hands of pagan Rome and unbelieving Jews? But soon these disciples were proclaiming a gospel in which Christ's cross and his resurrection were the central themes. (See RESURRECTION.) The instrument of a shameful and terrible death became the great symbol of the Christian faith. It appears in many great hymns, such as "In the Cross of Christ I Glory." The crucifixion became a theme for such artists as Fra Angelico, Giotto, El Greco, and Rubens, and for such musical compositions as Handel's *Messiah*, Rossini's *Stabat Mater*, and *The Crucifixion* by John Stainer.

The crucifixion gave Christian theology one of its central themes: the significance of Christ's death. There have been various theories. At one extreme is the penal substitution theory: the penalty of sin is death; Christ paid that penalty so that men could be forgiven. The moral influence theory, on the other hand, sees in the crucifixion simply an example of unselfish devotion. Certain vital convictions have been generally held. (1) The death of Christ was the final expression of His life, a life marked by trust in God, utter devotion to His will, and love of men. (2) God was in Christ, in His death as in His life, condemning sin, calling to repentance, bringing forgiveness and life. (3) The cross belongs to the life of every disciple. Deny yourself and take up your cross, said Jesus. "He that findeth his life shall lose it: and he that loseth his life for my sake shall find it" (Matt. 10:39). See JESUS CHRIST; CROSS. HARRIS FRANKLIN RALL

CRUELTY. See CHILD WELFARE; HUMANE SOCIETY.

CRUIKSHANK, GEORGE, 1792–1878, English caricaturist and illustrator, was born in London, the son of a well known caricaturist. Descended from Scotch Jacobites, the family had been ruined in defense of the Pretender, and after short stints as actor and sailor George took up art to help support his relatives. His father, Isaac, taught him the rudiments of draftsmanship, and by the time of the elder's death, George, then 18, was already a popular artist. Throughout his life Cruikshank was to regret lacking a classical background; nevertheless he soon distinguished himself as an engraver and earned the praise of such critics as John Ruskin. Charles Baudelaire wrote in 1857, that he was a man and artist to whom "the grotesque is a habit," hailing him for this "intelligence of the fantastic," and adding, "The grotesque flows from his burin, as rich rimes from the pen of a natural poet." This grotesque seemed to the critic a form of burlesque connected with the foulness of evil, as Ruskin had held; because such burlesque refused to deny the presence of evil in the world it gave the expression of evil a positive value. It was this quality of the sinister, the violent and bold, and the medieval which Baudelaire praised in Cruikshank's work.

METROPOLITAN MUS. OF ART

***The Sailors' Hornpipe,* amusing caricature by Cruikshank**

"Oliver asking for more," a Cruikshank illustration for Dickens' *Oliver Twist,* showing his talent for depicting human emotions by clever portrayal of facial expressions.

At 20 George and a journalist friend published *The Meteor*, a collection of illustrations which enjoyed a success as sudden and brilliant as its name. Toward 1815, he began to caricature regularly, although his contributions to *The Scourge* dated from 1811 to 1816. He also published work in almanacs and began to contribute to *Punch* and other journals of the day, notably *Town Talk* and *The Satirist*. The series of colored etchings contributed to *The Humorist* (1819–21) culminated in the etchings for *Peter Schlemihl* and for Grimm's *German Stories*. In 1822 he published *Life in Paris*, contributed woodcuts to the *Italian Tales* in 1824, and to Clark's *Three Courses and a Dessert* in 1830. The plates for Scott's *Demonology and Witchcraft* (1830) mark the end of Cruikshank's first and simpler approach to caricature; later he was to concentrate more on painting, less on etching. An interesting aspect of Cruikshank's psychology was his antialcoholism and he published several series of etchings against the "drinking curse," the most popular of which was *The Bottle* (1847); he also published *The Drunkard's Children* and the *Worship of Bacchus*, the latter originally an oil, one of the type of genre paintings he did in his later years and exhibited at the Royal Academy. His masterpieces include the illustrations for Dickens' *Oliver Twist*, Maxwell's *History of the Irish Rebellion*, and the complex etchings for Brough's *Life of Sir John Falstaff*. ANTHONY KERRIGAN

CRUISER, a warship usually with less tonnage, armor, and armament than a battleship, while larger than, and generally not so fast as, a destroyer; intended mainly for speed and range. Modern cruisers developed from the frigate of sailing days, ships designed for scouting, convoying, and commerce raiding. From the building of the *Constitution* and her sister frigates about 1797, the United States Navy was largely a frigate or cruiser navy, with very few larger ships. Even after the development and application of steam and armor, cruisers remained the characteristic vessels. The armored cruiser of the years around 1900 displaced 12,000 to 16,000 tons, carried

U.S. DEPT. OF DEFENSE

The USS *Salem* was the second of the CA class of heavy cruisers (17,000 tons) completed after World War II.

8- to 10-inch guns, and had speeds of 20 to 24 knots.

The British navy before World War I developed the battle cruiser, of battleship size but with fewer heavy guns, lighter armor, and greater speed. Similar cruisers were built by Germany. The sacrifice of armor made such cruisers vulnerable, as was demonstrated by the losses at Jutland, and by the losses of similar types in World War II. Construction of cruisers of smaller conventional size also had the problem of balancing armament, armor, speed, and range.

During World War I the lighter cruisers were employed chiefly in scouting and convoy duties. After the war, a distinction was made between light and heavy cruisers, not on the basis of tonnage, but of gun caliber. Light cruisers carried guns of 6 inches or smaller, heavy cruisers 8-inch. The naval treaty of Washington in 1922 (see NAVAL CONFERENCES) restricted cruisers to 10,000 tons displacement and 8-inch guns. The principal naval powers built cruisers within these limits, concentrating especially on light cruisers of two types: one large, with considerable range; the other smaller, with 5-inch guns, intended primarily for antiaircraft action.

With the virtual end of treaty restrictions, new construction was authorized, both in cruisers and battle cruisers. The German "pocket battleships" were a notable development of the years preceding World War II. Built to meet the requirements of the Treaty of Versailles for a maximum tonnage of 10,000, these three ships were small battle cruisers. Mounting six 11-inch and eight 5.9-inch guns, they were powered by diesel engines, and had a speed of 26 knots and a range of 16,000 miles. Their heavy armament and great fuel capacity necessitated a reduction in armor protection that proved disastrous in the case of the *Graf Spee*, which in 1939 was defeated by three British cruisers with inferior total fire power. The increased speed of the battleships built after 1932 resulted in a merging of the battle cruiser and battleship types. Such ships as the French *Dunkerque* and *Strasbourg* (eight 13-inch guns) and the German *Scharnhorst* and *Gneisenau* (nine 11-inch guns) had speeds which could rate them as battle cruisers. In 1941 the United States began to build the first battle cruisers in its history. These vessels displaced 27,500 tons and carried nine 12-inch guns. They were 808½ feet long, and had a range of 13,000 miles. Only the *Alaska* and the *Guam* were completed.

World War II. In 1940 the Great Powers had the following number of cruisers: United States, 18 heavy and 17 light; Great Britain, 3 battle cruisers, 16 heavy, 45 light, and 4 antiaircraft cruisers; Russia, 3 heavy, 2 light, and 1 older cruiser; Japan, 3 battle cruisers, 12 heavy, and 25 light; Italy, 7 heavy, 11 light, and 2 older cruisers; Germany, 2 battle cruisers, 2 heavy, and 3 light. At the time of the Franco-German armistice, the French navy included 7 heavy and 11 light cruisers. Of these, 4 heavy and 3 light cruisers were taken over by Great Britain.

By Dec. 7, 1941, the United States had 19 light cruisers in commission; 40 other light cruisers following basic prewar designs were on order. These vessels, of the Cleveland class, displaced 10,000 tons, were 608 feet long with a 63-foot beam, and unofficially were credited with a speed of 33 knots. They mounted twelve 6-inch 47 caliber guns in the main battery and twelve 5-inch 38 caliber dual-purpose guns, plus numerous 20 mm and 40 mm guns in the antiaircraft batteries. During 1942 and 1943 nine of the Cleveland class cruisers were converted to light aircraft carriers.

When the war began, eighteen 8-inch heavy cruisers were in commission. The last of the treaty cruisers, the U.S.S. *Wichita*, a 10,000-ton heavy cruiser, had been ordered in 1934. In July 1940 the Navy ordered four cruisers of the Baltimore class; these vessels displaced 13,000 tons and the main battery consisted of nine 8-inch 55 caliber guns, the same as most of the earlier heavy cruisers and only slightly different in speed from the treaty-built cruisers. The Baltimore class cruiser also mounted twelve 5-inch 38 caliber dual-purpose guns and, like other post-treaty vessels, was designed to mount numerous 20 mm and 40 mm antiaircraft guns. In 1942 a modified Baltimore class cruiser single funnel was ordered, but none of this class of cruiser saw war service.

During World War II cruisers carried out extensive scouting and patrol duties, attacked enemy shipping, and participated in task force operations against enemy coasts and islands. Only occasionally were cruisers engaged in extensive operations against enemy cruiser and battleship forces. British cruisers in the Mediterranean harried the numerically stronger Italian fleet, guarded convoys, and shelled Axis-held territory prior to Allied invasions. In a notable single-ship action in July 1940 the Italian light cruiser *Colleoni* was sunk by the Australian light cruiser *Sydney*. The *Colleoni* carried the same armament and was faster than the *Sydney* but her armor was too light to withstand the pounding of the British shells. Three large Italian cruisers were sunk by British forces in the Battle of Cape Matapan in early 1941. In the South Pacific several cruisers—United States, Dutch, and Australian—were lost to superior Japanese surface forces extending their control over the Java Sea in early 1942. Four United States and Australian cruisers were sunk in the Battle of Savo Island, near Guadalcanal, in the same year. Thereafter, because the Japanese fleet avoided a general surface action, Allied cruisers were engaged principally in task force operations, escorting aircraft carriers and supporting amphibious attacks. In both

the Atlantic and Pacific cruisers were used extensively in convoy operations, and many were attacked and damaged or sunk by aircraft or submarines. See World War II.

After World War II the remaining important naval powers tended to designate cruisers as the principal escorts for the aircraft carrier, now the chief sea weapon. Battleships were considered too slow and costly to be operated as protective antiaircraft vessels; cruisers, armed chiefly with antiaircraft guns, were faster and more maneuverable, and because of their large fuel capacity could operate as members of a fleet for longer periods. Both 6 and 8-inch gun cruisers are used as carrier escorts; in the latest types the heavy guns are quick-firing and fully automatic, with the ammunition being loaded entirely by machinery. Among these ships are the 14,000 ton Worcester class of light cruisers, with twelve 6-inch guns, and the heavy cruisers, *Des Moines*, *Salem*, and *Newport News*, 17,000 tons, armed with nine 8-inch guns.

In 1951 the U.S. Navy launched its first especially designed command-type cruiser, the *Northampton*. The 17,000-ton ship was first designed as a cruiser of the Baltimore class. Construction, suspended in 1945, was resumed in 1949 with radical alterations. The basic hull structure was used, but new armament and other features were added. Three cruisers were converted in 1954–55 to serve as ships for launching guided missiles. Proposals for future development of cruisers included further conversions to guided missile ships, and the construction of a cruiser driven by atomic power. See also Battleship; Naval Strategy and Tactics; Navy; Navy of the United States.

CRUMP, EDWARD HULL, 1876–1954, U.S. political boss, was born near Holly Springs, Miss. Crump left his backwoods home and began his climb to political power in Tennessee as a member of the Memphis board of public works, 1905. Backslapping his way to the control of the political machine, Crump, a Democrat, was mayor of Memphis, 1909–16. Gradually and ruthlessly he widened his field to become the political boss of Tennessee. He served two terms in Congress after 1930 and was again mayor of Memphis, 1939–41. Crump gave the city spacious parks, good schools, and adequate libraries, and maintained his form of benevolent boss rule until 1948, when his candidate for the U.S. senatorial nomination was crushed by Estes Kefauver.

CRUSADES, wars waged in the Middle Ages by the Christians of Europe for the recovery of the Holy Land from the Moslems. Jerusalem, Bethlehem, and the country associated with the life of Christ very early became places of special devotion and pilgrimage for Christians, even from the distant west of Europe. Though these lands fell to the Arabs in the seventh century, pilgrimages continued with some temporary stoppages and difficulties under Arab rule, and later under that of the Fatimid caliphs of Egypt. The difficulty of travel rather than direct religious persecution was the chief obstacle, which was augmented by the Seljuk Turkish conquests in Asia Minor and Syria in the eleventh century. See Palestine, History.

Reports of the persecution of Christians and of the delay or prevention of pilgrimages reached western Europe. The appeal of the Byzantine emperor Michael VII for co-operation between East and West, addressed to Pope Gregory VII, though not in itself a request for a crusade, increased western interest in Palestine and the desire for restoration of the holy places to Christian hands. Gregory was concerned for the Christians of the East, but his own difficulties prevented him from taking effective action. Pope Urban II, however, took up the cause; under his leadership the Council of Clermont in 1095 voted support for a military movement to retake the Holy Land. Christians who joined were promised spiritual favors and guarantees for their property and position while away. Urban himself addressed a great crowd at Clermont. The response of the crowd to his appeal, "God wills it!" became the cry of the crusade. The cross, usually of cloth sewed on the shoulder of the outer garment, became the sign of the movement and gave the crusade the name "Wars of the Cross."

The warriors of western Europe already had several generations of experience in conflict with Islam; many of them had gone to aid the Christians attempting to recover Spain from its Moorish rulers. (See Spain, History.) The motives attracting men to Palestine were much the same as those which brought them to Spain: a very real and strong devotion to religion; the desire for fighting and adventure; and the hope of winning booty and land.

The First Crusade. Following Urban's appeal at Clermont, the crusade was preached throughout western Europe. Some of the greater lords were persuaded to join, but required time to set their affairs in order and to gather and equip their forces. Many lesser knights and commoners were unwilling to wait for them. In four groups, not well enough organized to be called armies, these set out for the Holy Land.

One band, led by a Burgundian knight called Walter the Penniless, went overland through Hungary into the Balkan Peninsula. On the way, and especially after reaching Byzantine territory, unruly members clashed with the local population and members were lost. A second and larger band was led by Peter the Hermit, the most noted and popular preacher of the crusade. This group followed the same general route to Constantinople, losing members by desertion, disease, and squabbles with the people whose lands they crossed. The Byzantine emperor, Alexius Comnenus, allowed these first two bands to cross the Bosporus into Asia. Some of the more headstrong among them moved on the Turkish capital at Nicaea and were defeated with heavy losses. The third and fourth groups were less organized than the first two, and often divided into smaller bands. Most of the third group, largely German and led by a priest named Gottschalk, were killed in fighting the Hungarians. The fourth band, or collection of bands, from England, France, Flanders, and Lorraine, began by marching through the Rhineland, attacking the Jewish populations of cities on the way. This group, too, had heavy losses in Hungary. These expeditions suffered from lack of discipline, especially because the countryside through which they passed usually was unable to supply food for so many additional persons, and the attempts to secure subsistence led to strife.

During 1096 the expeditions organized by the greater lords began to set out, and in 1097 arrived at Constantinople. Some came overland, as had the ill-equipped and disorganized bands that preceded them. Others crossed from Italy to Dyrrachium (Durres) and thence across the peninsula to the Bosporus. Important leaders included Godfrey of Bouillon, the duke of Lorraine, with his brothers Eustace of Boulogne, and Baldwin; Raymond of Toulouse, one of the great lords of southern France; Robert, duke of Normandy, eldest son of William the Conqueror; Bohemond, son of Robert Guiscard, with Normans from southern Italy, among them his nephew Tancred; and Hugh of Vermandois, brother of the king of France. Adhemar, bishop of Le Puy in France, the papal legate, exercised the only measure of leadership over the whole body. Otherwise each small army followed its own lord.

The emperor Alexius Comnenus, who desired auxiliaries to fight the battles of the empire, found the numbers and character of these crusaders embarrassing and even dangerous. He persuaded most of the leaders to pledge some form of allegiance, and to promise to restore to the empire such of its former possessions in Anatolia as they should reconquer.

With supplies and guides furnished by the emperor, the crusaders moved into Asia Minor and, with naval help from the Byzantines, captured Nicaea in June 1097. They won a striking victory near Dorylaeum

BETTMANN ARCHIVE

Dieu le veult, **a painting by James Archer, depicts Peter the Hermit preaching the First Crusade. The ill-fated expedition was destroyed in the battle at Nicaea in 1096.**

on July 1, and recovered strategic positions in Asia Minor. Baldwin, Godfrey's brother, separated from the main army to move east into Mesopotamia. There he won the city of Edessa and some surrounding territory. The main army laid siege to the great commercial and strategic center of Antioch. They took the city but not the citadel on June 3, 1098, and massacred the inhabitants. The crusaders in turn were besieged by a Moslem army. The discovery of what was believed to be the Holy Lance—the spear with which the body of Christ was pierced after the crucifixion—encouraged them. On June 28 the Turkish army was routed and the crusaders took Antioch, which became Bohemond's possession.

The army moved southward, but it was a year before it came in sight of its goal, Jerusalem. Ports and strategic positions were occupied on the way. The city of Jerusalem, after a siege of five weeks, fell to the crusaders on July 15, 1099. The rivalries of the leaders, especially that between Raymond of Toulouse and Bohemond, were extremely bitter, and made the problem of permanent government a difficult one. Partly as a compromise, partly out of respect for his character, the leaders of the crusade decided on Godfrey of Bouillon as head of the new regime. Godfrey refused the title of king, preferring to call himself the defender of the Holy Sepulchre, but for all practical purposes he was King of Jerusalem.

The Kingdom of Jerusalem. With Godfrey's coronation, Nov. 11, 1099, began the development of the crusading states and of a feudal society in Outremer (beyond the sea), modeled after western Europe. Godfrey's kingdom at first included only the city of Jerusalem itself; gradually by conquest and negotiation it was extended to cover almost all of Palestine. Some of the areas and villages were held by local Arab or Syrian chiefs as vassals of the king. Others were given on feudal terms to the crusading knights. Baldwin, as prince of Edessa, and Bohemond, as prince of Antioch, and their successors were virtually independent rulers, whose subordination to the king depended largely on relative strength. Raymond of Toulouse and his successors, as princes of Tripoli, were similarly placed. See FEUDAL SOCIETY.

The crusaders were concerned with ecclesiastical establishments in the region. Their strong tendency was to foster Latin bishoprics at the expense of the Greek, Syrian, and Armenian rites, and thus to separate themselves from the local Christian populations. By the time their conquest of Jerusalem was established their relations with the Byzantine empire had deteriorated. Differences in culture, religious rites, viewpoints, and manners deepened the divergence in political and diplomatic objectives between the Greeks and the Franks.

The difficulties of the crusaders with their neighbors were intensified by their own internal dissensions over feudal prerogative, inheritance, and land, as well as purely personal antagonisms. Only occasionally was a king of Jerusalem strong enough to control the quarreling and rebellious nobles. The weaknesses of the kingdom were less dangerous than they might have been only because of the divisions among the Moslems surrounding them.

The failure to co-operate with the Byzantines made the routes to the East difficult; this cut off the soldiers and colonists whom Outremer needed to survive and grow. The Italian cities of Pisa, Genoa, and Venice prospered on the carrying trade and commerce of the Mediterranean, but permanent health was not achieved by the crusader states.

Military defense was considerably strengthened in the early twelfth century by the military orders. The Knights of St. John, or Hospitallers, organized first for charitable work, found it necessary to turn some of their energies to defending their institutions. More single in purpose were the Templars, a religious order of knights devoted to the defense of the Holy Land. Both the Hospitallers and Templars built castles and strong points, and acquired land and wealth. Because the orders could provide a constant flow of recruits and replacements, and a degree of unity and discipline rare among the lay knighthood, they were especially important in the affairs of the kingdom. See HOSPITALLERS; TEMPLARS.

BETTMANN ARCHIVE

An army of crusaders besieges Jerusalem with catapults. First conquered by Christian armies in 1099, the city was retaken by the Moslems during the Second Crusade in 1187.

The Second Crusade. In 1144 the principality of Edessa on the eastern frontier was conquered by Zengi, the atabeg or military commander of Mosul. His son Nur-ed-din followed up the victory with attacks on the kingdom of Jerusalem itself. Europe was aroused by the danger to its outposts in Palestine. A new crusade was urged by Pope Eugenius III and preached by St. Bernard of Clairvaux with considerable success. This time the rulers were persuaded to put themselves at the head of the movement; Conrad III, king of the Germans, and Louis VII, king of France, took the cross and gathered large armies. Conrad's army was severely defeated by the Sultan of Iconium (Konya) in 1147, a loss blamed by westerners on the lack of support from Manuel Comnenus, the Byzantine emperor. After an unsuccessful attempt to take Damascus in July 1148, the remnants of the armies returned home.

The knights left in the kingdom continued the struggle. They took Ascalon in 1153 and defeated

Nur-ed-din at Krak in 1163. It was from Egypt that the next menace came. The armies of Nur-ed-din, under Shirkoh and his nephew Salah-ed-din or Saladin, had made themselves masters of Egypt under the nominal rule of the Fatimid caliphs. (See Saladin; Egypt, History). Saladin overthrew the caliph and as ruler of Egypt moved on Palestine. In July 1187 he won a decisive victory over the crusaders at the Horns of Hattin. By October Jerusalem had fallen to the Moslems and the crusaders were driven back to the coast, where Tyre, Tripoli, and a few other posts held out.

The Third Crusade. This disaster stirred Europe. Frederick I, "Barbarossa," the Holy Roman Emperor, Philip II Augustus of France, and Richard I (Coeur de Lion) of England, all took the cross. Barbarossa was drowned in an accident in Asia Minor, June 10, 1190, and his troops were joined to those of the French and English kings. Richard delayed in Italy and Cyprus, but once in Palestine he dominated the crusade. In July 1191 Acre fell after a siege of almost two years, begun before the arrival of the crusade. Richard's military reputation was enhanced by the fighting, but his character was blackened by a massacre of the prisoners which followed. Philip, more concerned with politics at home and deeply antagonistic to Richard, left for France after the recovery of Acre. Richard remained, demonstrating his ability and courage in combat. Saladin was defeated at Arsuf, Sept. 7, 1191, and Richard took Ascalon and Jaffa. Fighting and negotiations both went on, until a treaty was arranged in September 1192. The Christians kept the coastal cities, and were granted free access to Jerusalem and the holy places, but the city and most of the country remained in Saladin's hands.

The Fourth Crusade. The crusading urge had not died in the West, and it was fostered by Pope Innocent III, from the time of his accession in 1198. A group of French lords and knights took the cross, but were diverted by an appeal from Alexius, son of the deposed Byzantine emperor Isaac II Angelus. Arrangements were made for transportation and alliance with Venice, whose doge, Enrico Dandolo, became the dominant figure in the expedition. The crusaders stopped to take the city of Zara in Dalmatia, previously taken from Venice by the Hungarians. They were vigorously denounced by Innocent for this attack on Christians. In Constantinople the crusaders were able to place the deposed Isaac and his son Alexius on the throne. The opposition of the populace was strong and a new emperor, Alexius V, was crowned. In rage and greed the crusaders in April 1204 attacked and sacked Constantinople, probably the richest and most beautiful city of the time. They then proceeded to organize a Latin Empire under Baldwin of Flanders. (See Byzantine Empire.) The area around the city, the islands of the eastern Mediterranean, and most of Greece, especially the Peloponnesus, or Morea, were divided between Venice and the crusaders, many of whom founded feudal estates. Whatever desire to rescue the Holy Land had originally moved the participants in the Fourth Crusade was lost in this dismemberment of the great Christian Empire.

The Children's Crusades. About 1212 two movements of children started out to rescue the Holy Land, with the idea that the innocence of the children might accomplish with God's help what men could not. In France a shepherd boy, Étienne, from Cloyes, near Vendôme, announced that he was directed in a vision to lead an expedition to crush the Saracens. He and the followers he attracted preached across France, and thousands of children joined him and gathered at Marseilles. They expected the sea to open before them, but when it failed they embarked in seven vessels. Two of these were wrecked off Sardinia, and the other five were captured, evidently by prearrangement, and the children taken to the slave

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Built early in the thirteenth century by the Knights of St. John of Jerusalem, the Kraks des Chevaliers fortress in Syria was captured about 1271 by the sultan of Egypt.

markets of Alexandria and Baghdad. A few were released years later in accordance with the treaty between the Emperor Frederick II and the Sultan al-Kamil of Egypt in 1229. The second children's movement was German, led by a boy named Nicholas, who gathered thousands, some of them older people, but mostly children. They crossed the Alps to Italy, and, like the French children, were disappointed when the sea did not open. Many were persuaded by the pope to return home.

Later Crusades. After the diversion of the Fourth Crusade, Innocent continued to urge the movement, notably at the Lateran Council of 1215. His successor, Honorius III, followed the same program and won promises from the young Hohenstaufen emperor Frederick II. Frederick, however, repeatedly postponed action. An expedition under the King of Hungary, the Archduke of Austria, and the King of Cyprus, which is sometimes called the Fifth Crusade, fought several battles in Palestine without much success, 1217–18, and then moved to Egypt. It took Damietta, the fortress guarding the mouth of the Nile, in 1219, but was halted there. In 1221 the crusaders were forced to arrange a truce and depart.

In 1228 Frederick II, by now in conflict with the papacy and excommunicated, finally undertook to fulfill his pledge to take the cross. Through his marriage to Queen Yolanda he was a claimant to the throne of Jerusalem. In 1229, without fighting, Frederick and the Sultan of Egypt negotiated a treaty which gave Jerusalem and Bethlehem (with a corridor to the sea) to the Christians, while guaranteeing the mosques and possession of most of the country to the Moslems. The possessions left to the Christian kingdom were very difficult to defend, and the 10-year truce soon broke down.

In 1244 St. Louis IX of France vowed to go on a crusade to relieve this worsened situation. He set out in 1248 and arrived at the Egyptian coast the following year. His crusaders took Damietta and advanced, but after heavy fighting near Mansourah were forced by disease and lack of food, as well as by the enemy, to retreat. On the way back, the king and most of his army were taken prisoners. After his release Louis continued the fight in Palestine, with limited success, until 1254. His second attempt ended in his death from disease near Carthage in 1270. See Louis IX.

An effort by Prince Edward of England, later Edward I, in 1271–72, won a truce and some protection for the possessions in Palestine. The crusader states depended for their safety in part on divisions in the Moslem world and on the Mongol invasions. As the latter died down the states of Outremer were once more under attack by superior forces. Antioch fell in 1267, Lattakieh in 1287, Tripoli in 1289. Acre, Tyre, Sidon, and the Templar strongholds of Tortosa and Athlit were taken in 1291. The Templars held

the island fortress opposite Tortosa until 1303, but for all practical purposes Palestine was Moslem.

The Christian West, and the popes especially, never gave up hope or the effort to recover the Holy Land. The monarchs and leaders of Europe were ordinarily too deeply concerned with other matters to pay more than lip service to the ideal of the crusade. The movements against the Ottoman Turks from the fifteenth century on served to protect Christendom from the infidel, but were not directly motivated by any concern for the Holy Land. Some aspects of a crusade also appeared in the continuing Spanish reconquest, completed in 1492. The campaign against the Albigenses in southern France in the early thirteenth century was preached as a crusade; many of the benefits promised crusaders were also promised the warriors who took part in it. See ALBIGENSES.

The effects of the crusades seem largely negative. At the conclusion of the movement the Holy Land was more thoroughly in Moslem control than at the beginning. The Byzantine Empire, the bulwark of Christendom, was irreparably weakened. The crusaders were familiarized with the achievements and tastes of the Moslem East, and the carrying trade of the Italian cities was increased, but just how large a part the Crusades played in the intellectual, cultural, and economic development of the later Middle Ages is open to question. By attracting the more adventurous and unruly, and giving occupation and sometimes estates to younger sons, the movement strengthened law and order in western Europe and aided in the rise of the new national monarchies, but again the exact degree is doubtful. The treachery and cruelty which marked much of their history, and the apparent futility of the effort, are in marked contrast to the faith, courage, and devotion which were sometimes the reality, and always the ideal, of the crusade. G. J. F.

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CRUSHER, a machine used to break rock, ore, and other materials into fragments. Crushers differ from grinders in giving only coarse-sized reduction, while grinders pulverize the material. They are often used to perform the rough breaking of a material such as ore before it goes to grinders for final reduction. Crushers are also used to crush stone for road surfacing, to break large lumps of coal at coal mines, and for many similar purposes. Crushers are usually driven by engines or electric motors, but sometimes by water power.

Types. Jaw crushers crush material between two steel jaws. In some, both jaws move toward each other; in others, only one jaw moves. Gyratory crushers have a hollow, cone-shaped housing into which the material is charged. A solid part, also cone-shaped, gyrates inside and crushes the material between it and the housing. Pan crushers consist of one or more wheels revolving in a pan. Material fed into the pan is crushed as the wheels roll over it. Roll crushers consist of two cylindrical rolls placed parallel to each other. As they rotate they draw the material in and crush it between them. The distance between rolls can be varied to produce the particle size desired. The rolls may be smooth, corrugated, or toothed. Rotary crushers resemble old-fashioned coffee mills, consisting of a cylindrical housing and a toothed cone that rotates inside the housing. Material is crushed between the cone's teeth and corresponding teeth on the housing wall. Hammer crushers have hammers pivoted on a horizontal shaft rotating in a housing. The material is crushed between the hammers and stationary plates.

CRUSTACEA, a class of invertebrate animals including lobsters, crabs, barnacles, and shrimps. There are about 25,000 described species of crustaceans, making them one of the larger classes of the phylum Arthropoda (see ARTHROPODA). Most crustaceans differ from other arthropods in that they have two pairs of antennae and respire either by gills or through the outer surface of the body. The majority are aquatic, although some have become adapted to living on land. Because of their abundance, Crustacea are sometimes called "insects of the sea" in tribute to a much larger class of arthropods, the insects.

One of the most striking characteristics of the class is its diversity. Crustaceans vary in size from the numerous microscopic forms to the giant crabs of Japan which may span 12 feet between the tips of their outstretched claws. They vary widely in appearance, some parasitic species being no more than a sack of eggs; others, such as the lobster and crayfish, have very specialized appendages for locomotion, respiration, apprehending and masticating food, and reproduction. Because of this diversity crustaceans are to be found in almost any aquatic environment.

The typical crustacean hatches as a microscopic unsegmented larva with three pairs of appendages; this larva is called a nauplius. Subsequent development may vary in the different crustacean groups. There may be several very different larval states before the adult form is attained, or some or all of the stages may be suppressed; in some groups the young emerges from the egg as a tiny replica of the adult, all of the larval stages having been abbreviated and passed through in the egg.

Classification. Because of the diversity of crustaceans, their classification is complex. Omitting the numerous intermediate groups, however, the class is now usually divided into six subclasses and about 30 orders.

Cephalocarida. This subclass was proposed in 1954 for a very small crustacean, *Hutchinsoniella*, found on the bottom of Long Island Sound. It is probably the most primitive member of the class.

Branchiopoda. This subclass includes the fairy shrimps (order Anostraca), tadpole shrimps (order Notostraca), clam shrimps (order Conchostraca), and water fleas (order Cladocera). Most branchiopods are restricted to fresh water. Crustaceans belonging to the orders Anostraca, Notostraca, and Conchostraca are usually found in ponds which fill during spring rains and dry up during the summer. Such animals have drought-resisting eggs and pass through their life cycle rapidly, in harmony with the transient nature of their habitats. The eggs are frequently blown about by the wind and carried to other regions on the feet of birds, so that the distribution of the species is never constant. However, one fairy shrimp of the genus *Artemia* occurs only in permanent bodies of highly salt water, such as Great Salt Lake.

The water-fleas include such forms as *Daphnia* that usually live in ponds, lakes, and streams, although a very few species also occur in the sea (see DAPHNIA). The life cycle of *Daphnia* and related species have received much study. These species are often parthenogenetic, that is, produce eggs that develop without fertilization. The young grow and form parthenogenetic females like their mother. This process is often repeated for many generations. At the onset of adverse conditions, however, males and females are produced. The resulting fertilized eggs are large and thick-shelled and pass unharmed through cold or drought to hatch into parthenogenetic females on the return of favorable weather.

Ostracoda. Animals of this subclass are usually small or minute crustaceans with a short body enclosed in a bivalve shell or carapace. Ostracods live in salt and fresh water, usually on or near the bottom. Most of them reproduce sexually, but some genera are apparently parthenogenetic. Like those of many primitive crustaceans, their eggs can withstand cold and drought for long periods. Fossil ostracods have been studied intensively because of their value as clues to the ages of geological formations.

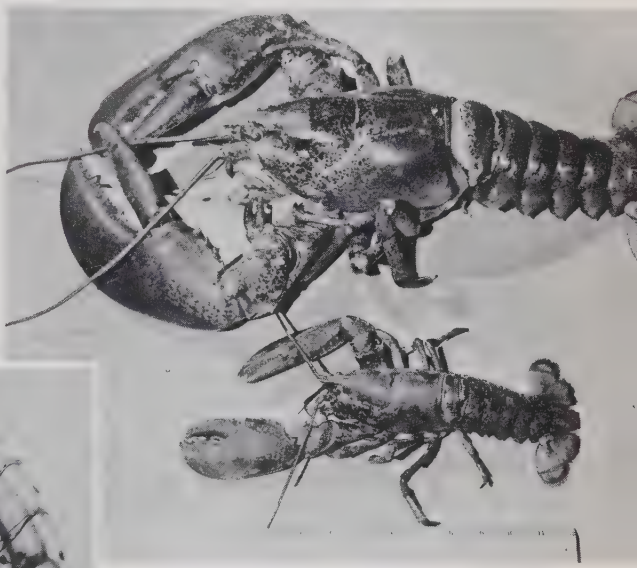
U.S. FISH AND WILDLIFE SERVICE

King Crab with Most of Legs Removed

DR. RALPH BUCHSBAUM

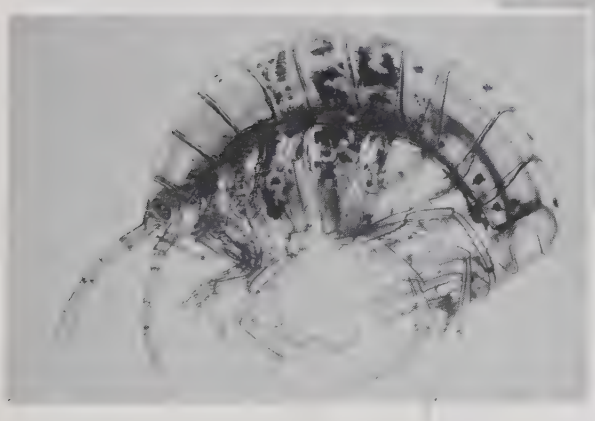
Marine Copepod

CRUSTACEA



U.S. FISH AND WILDLIFE SERVICE

Oversize and Normal Lobsters

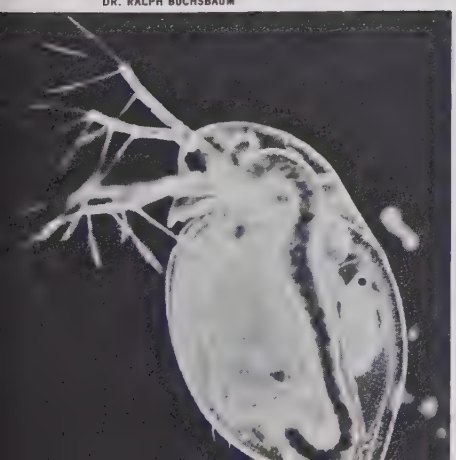


An Amphipod

AMERICAN MUS. OF NATURAL HIST.

Water Flea

DR. RALPH BUCHSBAUM



Fresh-Water Shrimp

P. S. TICE

Fresh-Water Isopod

P. S. TICE

Copepoda are usually small or minute crustaceans, which are either free-swimming, with an elongate, segmented body, or parasitic, with a greatly modified body. This important group is diverse in distribution and habits and includes both marine and fresh-water species, many of which are parasitic, living on the skin or gills or burrowing into the flesh of fishes. Of the free-living forms, the fresh-water *Cyclops* and the marine *Calanus* are especially well known. Some of the marine species are often abundant enough to color large areas of the sea and are of great economic significance as food of herring, mackerel, and the Greenland whale. Extreme parasites, such as *Sphyrion*, are unsegmented and live with the head and part of the body buried in the flesh of marine fishes; the male is a diminutive creature attached to the body of the female.

All of these genera of copepods belong to the order Eucopepoda. There are two other orders so distinct from the true copepods that they are sometimes treated as distinct subclasses. The order Mystacocarida was established in 1943 for a microscopic crustacean, *Derocheilocarus*, found living between the sand grains on Massachusetts and Connecticut beaches. The other order, Branchiura, is represented by the well known fish louse, *Argulus*, chiefly found clinging to fresh-water fishes by means of sucking disks.

Many of the crustaceans belonging to the subclasses Branchiopoda, Ostracoda, and Copepoda are planktonic, that is, small, free-swimming or passive organisms unable to make headway against a current. (See PLANKTON.) They are of immense economic importance because nearly all fishes are directly or indirectly dependent upon them for food.

Cirripedia. Familiarly known as barnacles, the cirripeds are marine crustaceans which, because of their calcareous shells and sessile mode of life, were classified as mollusks by early zoologists. (See BARNACLE.) In the adult stage cirripeds look very little like crustaceans, but their life history provides good evidence of their relationship to these animals. Most barnacles are hermaphroditic, that is, the single individual is both male and female. They hatch as a nauplius, the typical primitive larval form. These nauplii grow and enter a second larval stage known as a cypris larva which resembles adult ostracods in having a bivalve shell. At this stage the animals settle and become sessile adults attached on rocks or other objects in the sea. Besides the Thoracica, to which most of the well known barnacles belong, there are four other orders of cirripeds: the Acrothoracica, a group of boring forms; the Ascothoracica, parasites which retain the bivalve shell of the cypris larva as adults; the Apoda, an order of parasites without shells; and the Rhizocephala, which are degenerate, sacklike parasites of decapod crustaceans. A well known example of the Rhizocephala is *Sacculina*, which lies beneath the folded abdomen of a crab and feeds on the tissues and fluids of its host by absorption through numerous bifurcating, rootlike threads.

Malacostraca. The first four malacostracan orders include crustaceans having a bivalve shell and are intermediate between the lower orders and the true malacostracans. They are the Nebaliacea and three orders of fossil species: Rhinocarina, Ceriatocarina, and Hymenocarina. *Nebalia*, a genus of Nebaliacea which contains a few widespread species, is a well known example of these transitional groups. The next order, Anaspidacea, includes some primitive malacostracans found in mountain streams of Australia and Tasmania and in subterranean waters of Europe.

The order Mysidacea includes the opossum shrimps which are characterized by a thin carapace attached at the front end only. Most of them lack gills. Their eggs are incubated in a pouch on the underside of the thorax, hence the common name. Although most species are marine, a few occur in fresh water. They are often very important members of the plankton, both in the sea and in large lakes. The Thermosbaenacea is an order of small, stubby crustaceans which were found in hot springs of northern Africa where they endure temperatures as high as 112°F.

The Cumacea are small crustaceans with a broad, deep carapace covering only the anterior part of the cephalothorax. Although commonly found in the mud and sand of the sea bottom, they sometimes come to the surface at night in such numbers as to be an important source of food for fishes.

The Tanaidacea were once classified as members of the order Isopoda, but the small carapace and partially stalked eyes of these tiny, bottom-living marine animals justify the establishment of a separate order for them. The order Isopoda is a diverse assemblage which includes the familiar sow bugs often found under stones and logs and in cellars of houses. Although most of the isopods are marine, the terrestrial species are numerous, and one important family, *Asellidae*, is confined to fresh water. The marine species are often abundant enough to be an important source of fish food, but nearly as many are serious parasites of fishes. Some isopod parasites are as degenerate as the cirriped parasites, and they are sometimes parasitic on them. One marine form, the gribble, *Limnoria*, is a menace to wooden marine structures, which may be so riddled by this little borer that they soon disintegrate.

The Amphipoda are the scuds, beach fleas, and skeleton shrimps. Most of them differ from typical isopods in having the body compressed from side to side rather than from top to bottom and in having the appendages more specialized for different uses. The majority of the species live in the sea and may be extremely abundant, especially in the Arctic. A few occur in fresh water, and there is one terrestrial amphipod in the warmer parts of the world which sometimes invades houses in sufficient numbers to become a nuisance. Otherwise the amphipods are usually harmless. Only one group, the whale louse, *Cyamus*, is in any sense parasitic, although it does virtually no damage to the whale on which it lives.

The Euphausiacea comprise a small but important order of pelagic marine crustaceans which appear to be intermediate between the mysids and the true shrimps. They resemble mysids, but the carapace is attached throughout its length, and gills are lacking in most cases. The majority of euphausiids are luminous. They form an important part of the diet of baleen whales; a moderate-sized blue whale is said to consume two or three tons of euphausiids at a meal.

The order Decapoda includes the best-known crustaceans: shrimps, lobsters, crayfish, hermit crabs, and crabs. (See SHRIMP; CRAYFISH; CRAB.) All of them have a carapace or head shield, stalked eyes, and, basically, five pairs of walking or pinching legs. Most members of the order are marine, and several genera are commercially important as foods: the shrimps, *Penaeus*, *Pandalus*, and *Crango*; lobsters, *Homarus*; spiny lobsters, *Panulirus*; king crabs, *Paralithodes*; blue crabs, *Callinectes*; rock crabs, *Cancer*; and stone crabs, *Menippe*. The hermit crabs, *Pagurus*, have a soft, asymmetrical abdomen and occupy a succession of empty snail shells. Oyster crabs, *Pinnotheres*, living in the mantle cavity of oysters and partaking of their food and protection, are examples of commensalism (see COMMENSALISM). Few if any of the more than 8000 species of decapods are true parasites and few are very destructive, although land crabs and burrowing crayfish may be pests in some agricultural regions. One or two of the fresh and brackish water crabs damage dikes and levees by burrowing into them.

Several groups of shrimps, *Palaemonetes*, *Macrobrachium*, and *Atya*, and crabs, *Potamon*, have become adapted to life in fresh water. Probably the best-known fresh-water crustaceans of North America are the crayfish, *Cambarus*, *Procambarus*, and *Orconectes* east of the Rocky Mountains, and *Pacifastacus* along the Pacific coast. Several hermit crabs, *Coenobita* and

Birgus, and crabs, *Cardisoma* and *Gecarcinus*, spend their entire lives on land except when they go to the sea to hatch their eggs. One crab in Jamaica even lives in the tree tops and the young mature in the rain water trapped in the leaves of bromeliad plants.

The final order, Stomatopoda, includes the mantis shrimps, so called because of their superficial resemblance to the praying mantis insect. Some of the relatively few species of mantis shrimps may be found in most tropical and warm temperate seas where they sometimes form an important source of food for certain game fishes. FENNER A. CHACE

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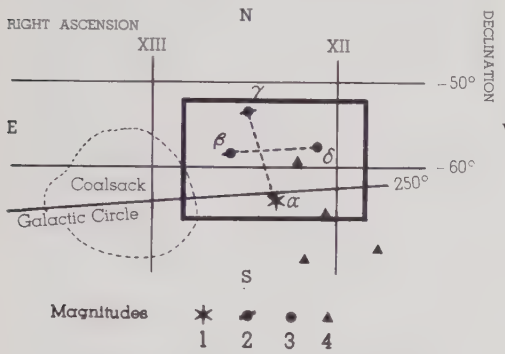

Constellation Crux or Southern Cross

CRUX, the Southern Cross, a small southern constellation in a brilliant section of the Milky Way, close to the dark Coalsack. It bears much the same relation to the earth's South Pole as Ursa Major does to the North Pole. (See CONSTELLATION.) Since it lies between 25° and 35° from the S celestial pole, the Southern Cross is not visible north of the latitude of southern Florida, but 5000 years ago it was visible in England. (See PRECESSION.) The Cross owes some of its striking effect to the fact that when it is on the meridian it is standing upright, with the long axis nearly exactly a north-south line. At the bottom of the Cross, nearest the pole, is the first star α Crucis, with a brightness of first magnitude (see MAGNITUDE). The rest of the quartet, in clockwise order around the Cross, are β, γ, and, δ whose magnitudes are 1.5, 1.6, and 3.0 respectively. Visually, or photographed in red light, β and γ appear about equally bright, but in ordinary photographs β appears much brighter than γ, which is a yellow star (see MAGNITUDE, *The Color Index, I*). δ Crucis is really a double star (see DOUBLE STAR) and each component is itself a spectroscopic binary with a rotation period of one day. The complete Southern Cross is used as a symbol in the Australian flag.

CRUZ, RAMÓN DE LA, 1731–94, Spanish playwright, was born in Madrid and spent most of his life there. He is chiefly remembered for his *sainetes*, short comic interludes often written in verse and sometimes set to music. Cruz used typically Spanish themes, in contrast to the French- and Italian-influenced writing of the day; his *El Prado por la noche* (1764) is a sprightly comment on manners and morals in Madrid, and *El sainete interrumpido* (1766) is a racy description of backstage theater life as he knew it. He also translated many French, Italian, and English plays and produced the first Spanish translation of *Hamlet*.

CRUZ, SAN JUAN DE LA, or St. John of the Cross, 1542–91, Spanish poet and mystic, was born Juan de Yepes at Fontiveros, Avila. In 1563 he became a Carmelite, and in the four years following studied at the University of Salamanca. He joined St. Theresa of Avila in her reformist endeavors, and together they founded the Discalced (unshod) Carmelites. In 1567 San Juan was arrested for disobedience and held prisoner in a convent of regular Carmelites in Toledo; he escaped after eight months to found another convent, and eventually to become head of the order he had founded. He was canonized in 1726. San Juan's poetry is of first importance in the history of Spanish literature, and he is regarded as one of the great mystics in world literature. His three chief works are *Dark Night of the Soul*, *Canticle of the Spirit*, and *Flame of Love*. Similar in their technical perfection, complex symbolism, and ecstatic rapture of love, all three have as their central theme the mystical union of the soul with the Godhead and the delights of Divine Love. In *Dark Night*, "the soul sings of its good fortune in passing through the dark night of faith, in nakedness and self-purgation, to union with the Beloved." *Canticle of the Spirit*, his most extensive poem, admixes the spirit of Solomon's *Song of Songs* with Renaissance and medieval elements. *Flame of Love* is a joyous exclamation; the poet's own prose commentaries on the poems explains that "the Flame of Love is the spirit of its Husband, who is the Holy Ghost." ANTHONY KERRIGAN

CRUZ ALTA, city, SE Brazil, in the state of Rio Grande do Sul, in the foothills of the Serra Geral, 170 miles NW of Pôrto Alegre. Cruz Alta is a railroad junction in a livestock raising area. Industries are meat packing, flour milling, and the manufacture of farm machinery. Pop. (1950) 19,824.

CRYOLITE, a mineral fluoride of sodium and aluminum. Transparent or translucent, it has a vitreous or greasy luster and a very low index of refraction, nearly the same as that of water. The mineral has the appearance of wet snow. Cryolite has a specific gravity of 3 and a hardness of 2.5 (see HARDNESS). Its composition is represented by the formula Na_3AlF_6, which crystallizes in the monoclinic system (see CRYSTALLOGRAPHY). Ivigtut, on the west coast of Greenland, is the location of important deposits of cryolite. Small quantities are found at the foot of Pikes Peak, Colo. Cryolite is used as flux for cleansing metal surfaces, in the manufacture of glass and porcelain, and in the production of sodium salts. It was formerly the chief ore of aluminum, and later was used as a flux in the electrolytic process of obtaining aluminum metal from bauxite (see BAUXITE). Most of the sodium aluminum fluoride used today in the aluminum industry is made artificially by chemical processes. See ALUMINUM, Aluminum Compounds.

CRYPT, a vault wholly or partly underground, especially a burial chamber under the sanctuary of a church. During Christian times the catacombs were used for burial. After the period of persecution ended, many churches were built around the tomb of a martyr or on the spot of his martyrdom. The crypt developed as an underground burial chamber for important figures of church and state; during the Middle Ages it was often built as a subterranean church of vast proportions. Two notable crypts are those of St. Mark's at Venice, Italy, and of Canterbury in England.

CRYPTOBRANCHIDAE, a family of amphibian animals which includes only three living species. Two species, the common hellbender, *Cryptobranchus alleghaniensis*, and the Ozark hellbender, *C. bishopi*, are native to North America, where they inhabit mountain streams. Destroying quantities of game fish, stealing bait from anglers, and inflicting painful bites when hooked, these large, ugly salamanders have earned a bad reputation among fishermen. See HELLBENDER.

The largest of all living amphibians is the third species, *Megalobatrachus japonicus*. Some specimens of this purplish-brown giant salamander may grow up to 5 feet long, and weigh nearly 100 pounds. They live in the swiftly flowing icy streams in the mountainous regions of the Island of Hondo in Japan, and in the highlands of western China, and are easily

captured with a baited hook and a stout line. Their reportedly delicious flesh is a prized foodstuff among Japanese.

CRYPTOGAM, a flowerless plant that produces spores. Flowering plants that produce seeds can be classified as phanerogams. The procedure of separating plants into cryptogams and phanerogams has been largely replaced by other, more accurate, systems of classification. See CLASSIFICATION OF LIVING THINGS.

CRYPTOGRAPHY, the art of secret writing, whether in cipher or code, or with invisible inks, although in its usual and most important sense it applies to writing in ciphers. In military and diplomatic activities, both in peace and war, its role is one of greatest secrecy and its use is continual. *Cryptanalysis*, the solution and reading of cryptic messages, is the constant work of many experts in the so-called "black chambers" of the foreign offices of every nation.

Essentially cryptography is concerned with ciphers, of which there are three major classifications. The *concealment cipher* has the true letters of the message which the sender desires to transmit hidden or disguised. The famous bilateral cipher of Francis Bacon (1561–1626), in which he used mixed fonts of type so as to conceal the fact that he was using a cipher, is an example of this type. The *transposition cipher* takes the true letters of the message out of their actual text order and rearranges them according to a pattern or *key* which has been previously agreed upon by the correspondents. In the *substitution cipher* the original text letters are replaced by substitutes or cipher symbols arranged in the same order as the original message. The cipher symbols in this type of cipher may be letters or numbers. In addition, there are combinations of each of these major types and several forms of each classification. In the substitution cipher, for example, there may be more than one substitution, the first encipherment being in turn enciphered; a message put in substitution cipher may have the resulting message enciphered by transposition. Such multistep ciphers can be very complicated, a fact well-illustrated by a book attributed to Roger Bacon (1214?–94), which has never been deciphered; it is so baffling that some authorities have suggested that the whole book was a hoax.

Strictly speaking, cryptography makes clear definition between ciphers and *codes*. In codes, where a single word may be used for an entire phrase, some mechanical device is necessary both to encipher and to decipher the transmitted message. In a cipher, once the key is learned, any message transmitted may be read by the interceptor. In codes, equipment such as a code book or code dictionary is necessary to read the intercepted or received message. Commercial telegraphic codes are an example; their code dictionaries are comparable in bulk to an unabridged English dictionary.

A Cryptogram is any message written in cipher. The term *message* is used by cryptographers to describe the enciphered *clear*, or communication that is to be transmitted.

Substitution ciphers are among the most commonly used, the simple substitution cipher being the easiest form. But as Edgar Allan Poe showed classically in his story *The Gold Bug*, certain letters of the alphabet recur at a known frequency in any given number of words. Thus this form is the simplest both to encipher and to decipher. In ordinary literary English the relative frequency of letters is e, t, a, o, i, n, s, r, h, d, l, u, c, f, m, p, y, g, w, b, v, k, j, q, x, and z, with minor variations in telegraphic English. All languages yield similar frequency tables. These frequencies may be hidden by using more than one symbol for each letter in the alphabet. In *double substitution ciphers* the letters of the clear are represented by letters which vary according to a system based upon a key word.

Another type of cipher is the *grill cipher*, in which the letters of the clear are hidden in a written or printed passage, becoming readable only when a grill with a prearranged pattern of holes is placed over the message. *Syllable ciphers*, in which syllables, pairs, or triplets of letters are enciphered instead of single letters, are rarely used. In this cipher type, frequency tables again are the basis of decipherment. Bigrams (pairs of letters), trigrams, syllables, and even words have regular recurrence in any language. These tables are the cryptographer's chief tool.

Frequency Tables make it possible to decipher any cryptogram; hence, particularly in military and diplomatic usage, the chief value of ciphers lies in the delay involved in reducing messages to the clear. The process of reading a cryptogram may be speeded and the value of the cipher destroyed if the cipher can be *broken*. To *break* a cipher or code is to discover the means or system by which it is composed.

A description of the major forms of ciphers and codes is in itself a history of cryptography. The simplest substitution ciphers were first used by the ancient Greeks, and among the better educated it was a pastime to exchange messages in either substitution or transposition ciphers. The ruling class of the Roman Republic developed substitution ciphers to a marked degree, and since the Renaissance cryptography has been constantly used by governments, armies, and navies. And it has been in such service that the great major ciphers have been developed.

The basis of most modern ciphers was developed in Paris by Blaise de Vigenère during the reign of Henri III. A method of double substitution, it was the greatest contribution to cryptography since Roman times. Called the *Vigenère tableau*, the cipher requires only that sender and receiver memorize an arrangement of letters. Adaptation of this tableau to the English language results in the rectangular arrangement of 728 letters according to a certain pattern. A key word is used to encipher messages. The clear is written out with the key word written over it, and repeated as many times as necessary, each letter of the clear matching a letter of the key word. The tableau has alphabets at the top and side of the prearranged letter pattern. To encipher, the cryptographer finds the first letter of the key word in the top alphabet. He follows down the line under it until he encounters the letter in the pattern opposite the first letter of the clear. This is his substitute for the message. This process is repeated for each of the letters in the clear.

When the message has been completed with readings from the tableau, the resulting letters are usually arranged in groups of five, so that bigrams and trigrams, and particularly individual word lengths, may be disguised. It also is common practice in cryptography to intersperse the message with *nulls*, meaningless symbols designed to confuse anyone attempting to decipher the message. Symbols for *stops*, designating the ends of sentences or even of words, also are used.

Reading such a message is simple for anyone knowing the key word. The recipient sets up the tableau and runs down the first letter of the key word until he encounters the first letter of the message. The first letter of the clear is read from the side alphabet. In modern usage the practice is to reverse this procedure. The key word is written beneath the clear, the first letter of the clear selected in the top alphabet, and the side alphabet used for the key word.

Just as Vigenère's tableau had superseded the earlier and historically important cipher of Porta of Naples, which had required a special key table, Vigenère was improved upon by the German, Graf Gronsfeld.

Gronsfeld's Cipher was based upon a set of key numbers, short enough to be easily memorized. The numbers were written down over the clear, repeated as often as necessary. To encipher the message the letter appearing under the first number of the key

was substituted by that letter of the alphabet which was the corresponding number of letters farther down in the alphabet. Thus if the first letter of the clear were "c" and the first number of the key were 8, the first symbol of the message would be "k." This cipher became popular in central Europe and for many years was widely used as the cipher of campaigning armies. Frederick the Great is known to have used it for diplomatic correspondence with Ferdinand of Brunswick. It fell into disuse, however, because it could be broken down by the use of repeated alphabets: it used only the 10 top lines of the Vigenère tableau.

The next important cipher did not appear until 1880 and it, like the Gronsfeld cipher, was based upon Vigenère. Sir Francis Beaufort, an English admiral, sought to simplify the writing of the Vigenère and to make deciphering of messages more difficult. The Beaufort cipher is fundamentally a Vigenère tableau, but instead of having index letters at top and side it has them only at the right of the tableau. The key is written beneath the clear and the first letter in the clear is found in the first line of the tableau itself. Enciphering and deciphering are carried out as with the Vigenère cipher.

In the same year that Beaufort produced his cipher, the French military academy of St. Cyr developed the St. Cyr ruler. This was a mechanical device for military ciphers, operating on the same principle as the slide rule. The stock of this rule has a single alphabet engraved upon it. The slide has two alphabets, the spacing between the letters corresponding to that of those on the stock. The slide is adjusted so that the first letter of the key word is beneath "A" on the fixed alphabet. The first letter of the clear is read on the fixed alphabet and its cipher equivalent on the slide.

Disk Cipher. Another method long in use in France for army field ciphers was the disk cipher. Scrambled alphabets are engraved on the rims of a series of disks. The clear is set on one horizontal line and any of the remaining 25 lines is used for the message. When this scrambled line is set by the recipient, the only intelligible line is the clear. Disk ciphers have largely been outmoded for use in field ciphers. One of the more recent, as well as one of the simplest and best ciphers ever devised, is the famous Playfair cipher, based on a key word. This word is written in the first positions of a five-letter square containing the alphabet, from which "J" is dropped. If the key is MASCULINE, the square, with letters not in the key following those in it, is arranged in the manner indicated in the following:

M	A	S	C	U
L	I	N	E	B
D	F	G	H	K
O	P	Q	R	T
V	W	X	Y	Z

For enciphering, the clear is divided into two-letter groups. When two letters appear in the same column, the letter below each is substituted. When two letters occur in the same line, the letters to the right of each are used, but if the last letter in the line or column appears in the clear, then the first letter of the line or column is used as that after the last. If letters are in neither the same line nor column the pair at opposite corners of the rectangle for which they form a diagonal are used. Double letters are separated by inserting "X" or "Z."

The chief objective of military ciphers in the field is to gain time. Simplicity is therefore important. A single error in enciphering or transmitting the message will garble the whole. Such a garbled message was partly responsible for the rout of Napoleon's Grand Army at Leipzig. A relief army was to cover the retreat from a dangerous position, but the commander sent a cipher to Napoleon stating that he could not arrive at the designated time. An error in enciphering the message made it unintelligible and Napoleon lost a large part of his forces.

Enciphering. Special mechanical means such as radio have also been used for enciphering messages. One of these is a four-channel transmitter which shuffles the message, either in the clear or ciphered, into an unintelligible garble. A rotating switch, synchronized with a similar switch on the transmitter, sorts out the message at the receiver, dividing it into its four previously scrambled parts. In World War I the German radio station at Nauen used a "lightning gibberish" broadcast to hide ciphers from Allied listening posts. The message was recorded and the transcription played for broadcast at very high speed. This resulted in a high-pitched whine. Only when a British officer, by accident, played a recording of this whine on a slow-moving phonograph turntable was the ruse discovered.

In World War II some field radio messages were enciphered through the use of an ancient underworld method—jargon. Seemingly meaningless words were used in normal sentence structures to convey information or orders. Criminals for centuries have used this and other means of encipherment to conceal the meaning of their communications.

Other simple methods of encipherment have included the translation of the clear into an obscure language before applying the cipher. In World War I American Indians were used in Europe on field telephone lines, and in World War II some were similarly engaged in the Pacific. Book ciphers or codes, in which the correspondents exchange page and line numbers, often have been used, but because some edition of a dictionary usually was chosen, they met with little success.

Similar to the book code and the commercial telegraphic codes are the codes used by diplomats and navies. These depend upon codes which can be solved successfully only by obtaining the special code book upon which the messages are based.

Naval Code Books are bulky, lead-coated volumes, whose location aboard ship is carefully guarded. In event of danger to the ship, these books must be jettisoned in heavy, perforated boxes or weighted canvas bags before the ship is captured or sunk. In past times, navies have conducted dangerous diving operations in order to recover code books of enemy nations.

Diplomatic codes, no matter how complicated or cleverly conceived, are seldom used for more than six months, even in peacetime, since they may be deciphered by experts at other nations' black chambers by use of methods applied to more simple cryptograms. The breaking of a Japanese code by the American black chamber before the opening of hostilities played an important role in later Pacific campaigns of World War II.

The most recent important development in cryptography, about which little was publicly known, was the invention of special machines for enciphering and deciphering messages. Messages enciphered by such machines were said to be virtually undecipherable except by holders of the machine.

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CRYPTOMERIA, an ornamental Japanese evergreen tree belonging to the redwood family, *Taxodiaceae*. The tree, *Cryptomeria japonica*, has an upright, slender trunk that often reaches a height of 125 feet. Its leaves are about an inch long and bluish green in color. There are many varieties of this tree; the variety most widely cultivated is *C. japonica elegans*, the foliage of which takes on a bronze color in autumn and keeps that color until the following spring. Although native to China and Japan, *Cryptomeria* are found growing in the northern United States.

CRYSTAL, village, NE Minnesota, in Hennepin County, on the Soo Line Railroad and U.S. Highway

52, 8 miles NW of Minneapolis; a suburb of Minneapolis. Pop. (1954 special census) 13,713.

CRYSTAL. See Crystallography; Crystallization; Crystalline Rock; Glassware; Radio.

CRYSTAL CITY, city, S central Texas, county seat of Zavala County, on the Nueces River, the Missouri Pacific Railroad, and U.S. Highway 83; 95 miles SW of San Antonio. Crystal City is an important shipping center for spinach and other vegetables and livestock products. It has a cannery and packing plant. Pop. (1950) 7198.

CRYSTAL LAKE, city, NE Illinois, in McHenry County, on Crystal Lake, the Northwestern Railroad, and U.S. Highway 14; 44 miles NW of Chicago. Crystal Lake, situated in a dairying area, is a trading center and manufactures diesel engines and electrical accessories. There is a petroleum research laboratory. Pop. (1954 special census) 5976.

CRYSTALLINE ROCK, any rock whose component minerals are in more or less perfectly formed crystals (see Crystallography). Such rocks differ from the clastic or fragmental rocks, such as soil, sandstone, and clay, (the ingredients of which are in broken, rounded fragments), and the organic rocks, such as limestone and chalk, which consist of the remains of animals or plants. The volcanic or igneous rocks, the crystalline schists (see Schist), and

CHICAGO NATURAL HIST. MUS.

Quartz Crystals

the precipitates, such as rock salt, anhydrite, and gypsum, have no definite arrangement. The term crystalline rock denotes the structure rather than the method of origin of its members and embraces a large diversity of rock types. The igneous rocks are also known as massive crystalline, as distinguished from the schistose crystalline metamorphic rocks, which they resemble in mineralogical composition, although differing in the relation of the minerals to one another. On this basis rocks are clastic, crystalline, or amorphous. See Amorphous Solid; Clastic.

CRYSTALLIZATION, a change in the arrangement of the atoms and molecules in a solid substance to form a definite, repeating three-dimensional pattern. Solids such as glass and plastics, lacking this internal order, are amorphous in structure and are often merely supercooled liquids. See Amorphous Solid.

The factors that determine the crystalline structure of a substance are largely the size of the atoms or molecules and the attractive forces existing between them. The individual particles in a crystal will vibrate back and forth, but any random motion is prevented by these attractive forces. The mobility of the particles may affect or prevent the formation of a crystalline pattern, especially if the substance has a high viscosity. Window glass, plastics such as Lucite, Bakelite, and polystyrene are examples of noncrystalline amorphous solids that are in reality highly viscose liquids with irregular molecular arrangement. Many normally amorphous solids can be made crystalline by slow cooling of the molten liquid, thereby allowing the atoms or molecules sufficient time to develop a stable arrangement. In

ARMOUR RESEARCH FOUNDATION OF ILLINOIS TECH.

DDT crystallized on a microscope slide and magnified 100 diameters appears as a jumbled pattern of rodlike forms. Every crystalline substance has a characteristic structure.

general, however, most pure substances can exist as crystals or as noncrystalline liquids or gases, depending only on temperature and pressure. Lowering the temperature will decrease the energy of motion of the atoms or molecules to the temperature at which the attractive forces between the particles can literally freeze the atoms or molecules into an ordered crystalline arrangement. This temperature is the freezing point for that substance; water, for example, freezes at 0°C or 32°F. On heating, the solid substance melts at the temperature at which the increasing energy of the individual atoms or molecules literally tears the crystal apart to form a continuously changing random arrangement of the particles.

Substances with strong attractive forces melt at higher temperatures than do those with weaker forces. A few melting points for common substances are sodium chloride, or table salt, 801°C; copper, 1083°C; iron, 1535°C; tungsten, 3370°C. These substances are crystalline below and liquid above their melting points.

Substances crystallize not only from the liquid state but can also condense as crystals from the vapor state. This phenomenon is the opposite of sublimation during which a solid passes directly into the vapor state. Frost condensing on a cold window pane in winter is a good example of crystallization from the vapor state. Crystallization can also occur from solution as in the case of salt which crystallizes out during evaporation of brine solutions. When water evaporates from brine the solution becomes oversaturated with salt, and the salt crystallizes. Another case of crystallization from solution is seen as sugar crystallizes when fudge cools. In this case the water in the cooler fudge will not dissolve as much sugar as was held in solution by water in warm fudge. The fudge is beaten to ensure the formation of fine crystals at this stage and hence produce a smooth, nongrainy product.

The crystallization process is important not only in making fine fudge and fine ice creams, but also in heat-treating of metals to produce alloys of proper strength, hardness, and ductility; in paint pigments to achieve good covering power and stability; and in cements, mortars, and other structural materials to increase their strength. Walter C. McCrone

CRYSTALLOGRAPHY is the study of crystals, their internal structure, their external form, their physical properties, and the interrelation of these factors (see Crystallization). Crystals are characterized by a definite, repeating, three-dimensional pattern of atoms or molecules usually referred to as lattice points. In terms of distances and angles the arrangement of corresponding lattice points is unique for each substance. Some substances have lattice points arranged at the corners of regular cubes, some at corners of regular octahedra, and some at the

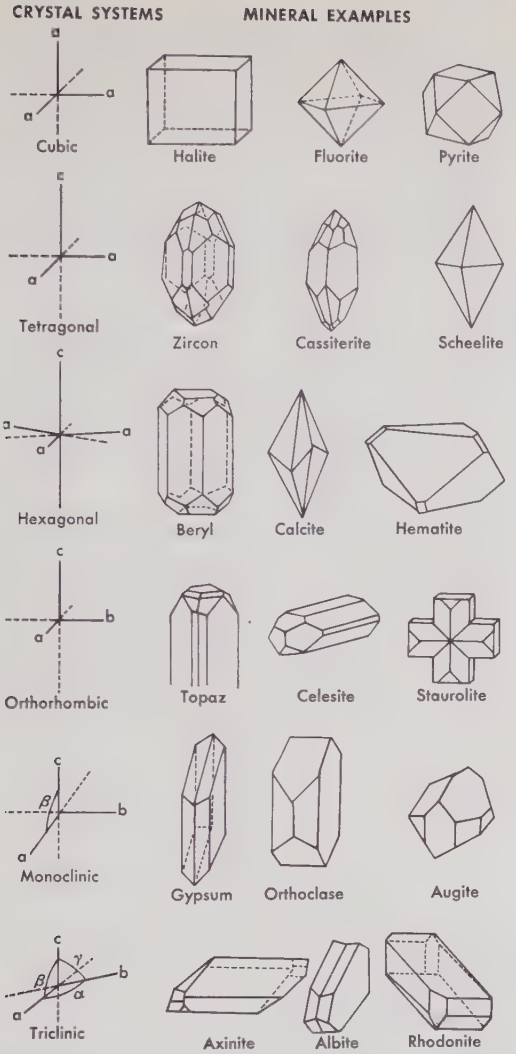


Fig. 1. The left hand column shows the six crystal systems and the position of their axes in space. These systems provide 230 possible crystal forms. Three representative minerals of each crystal system are in the adjacent columns.

corners of more complex configurations. Two hundred thirty different basic arrangements of lattice points, or space groups, are possible, and each of the more than 230 crystalline substances must crystallize in one of these space groups. However, substances crystallizing in the same basic arrangement differ in distances between lattice points, or in size and shape of the smallest crystal unit, the unit cell. Thus every crystalline substance has a distinctive unit cell which characterizes it implicitly.

X rays are used to determine the minute distances within the unit cell. Measurement is made in angstrom units, or A (see ANGSTROM UNIT). The regular disposition of lattice points in a crystal causes diffraction of the X rays in the same manner that the parallel lines of a ruled grating cause diffraction of visible light (see DIFFRACTION GRATING). If the wave length of the visible light is known and the diffracted angle is measured, the distance between the rulings on the grating is easily calculated. The spacing of lattice points in a crystal can be calculated from the angle of diffraction and the wave length of the X rays. Since a crystal is three-dimensional it is more complicated than a grating and, although the precise arrangement of the lattice points can be determined, the procedure may require one to two years for a crystal of a complex organic compound.

A study of its external structure and physical properties reveals much about the internal arrangement of the crystal. The fact that table salt, NaCl, crystallizes in the shape of cubes suggests that the unit cell is so arranged that sodium ions and chloride ions are located at the corners of cubes throughout the crystal. Furthermore, since the optical properties of salt are the same in all directions for any given crystal, the edges of the unit cell must be of the same length; therefore, the unit cell must be a cube.

CRYSTAL SYSTEMS

The external form of a crystal manifests the perfect internal arrangement of lattice points. Since the external faces of a crystal always lie parallel to the planes of its lattice points, the external form of crystals is described by any one of six coordinate systems of axes (see COORDINATE). These coordinate systems are the basis for the six crystal systems as follows (see Fig. 1):

CUBIC: Three mutually perpendicular axes, each with equal spacing of lattice points.

TETRAGONAL: Three mutually perpendicular axes with the same spacing of lattice points along two axes but different along the third axis.

HEXAGONAL: One axis perpendicular to the plane of three axes arranged at 120° to each other. The spacing is identical along the three axes in one plane but different along the axis perpendicular to this plane.

ORTHORHOMBIC: Three mutually perpendicular axes along each of which the spacing of lattice points is different.

MONOCLINIC: Two axes intersecting at right angles, with a third axis oblique to the other two. The spacing of lattice points is different along each of the three axes.

TRICLINIC: Three axes each oblique to the plane of the other two and each with different spacing of lattice points.

The different faces which occur on a given crystal are described by their intercepts on the appropriate coordinate system. These intercepts are measured in units a, b, c. In Fig. 2 ABC represents a standard or unit plane, the unit intercepts being a, b, c, which in this case are all equal. Any other face, such as JKM, will have intercepts on the axes OZ, OY, OX in simple multiples of a, b, c. In the figure these multiples are 2, 2, and 3 and the notation for the crystal face JKM as suggested by C. S. Weiss are 2a, 2b, 3c. See COORDINATE, *Three Dimensional Systems*.

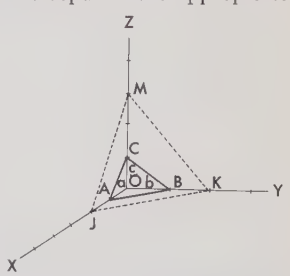


Fig. 2. The intercepts of the face of a crystal along its crystallographic axes are always found to be equal to the unit intercepts, *a, b, c,* or some simple integral multiple of them. This fact is illustrated above, the multiples being 2*a*, 2*b*, 3*c* for the face *JKM*.

In 1839 W. H. Miller suggested a crystal notation system that is a reciprocal of Weiss' multiples; thus the crystal face JKM would be $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{3}$ and the integral ratio (multiplied by 6) would be 3:3:2. These numbers are called the Miller indices and the notation for the face JKM would be 332. The face ABC is represented by 111. The faces of a cube, for example, cut only one axis and are parallel to the other five axes. Thus the Weiss indices for the three faces of a cube would be 1a, ∞b, ∞c; ∞a, 1b, ∞c; ∞a, ∞b, 1c. The corresponding Miller indices would be 100, 010, 001.

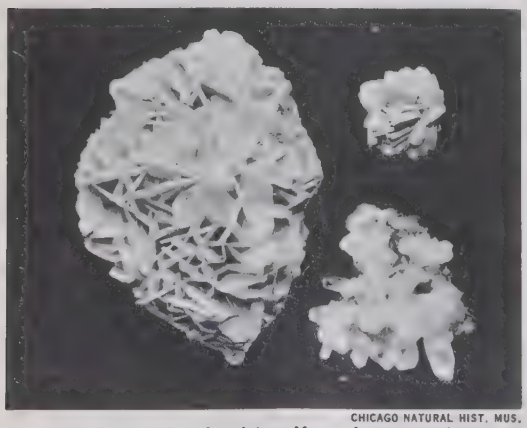
The law of rational indices and the law of constancy of interfacial angles govern the size and shape of crystal faces. The law of rational indices states that the intercepts at which different faces of a given crystal cut each axis are always related as simple whole number multiples. The law of constancy of interfacial angles states that all crystals of a given substance, no matter how or where crystallized, always show constant interfacial angles between corresponding faces even though the physical dimensions may vary. Thus cubes of sodium chloride may be perfect equidimensional cubes or elongated boxlike crystals, but the cube faces will always lie 90° from each other. These two laws form the basis for characterization and identification of compounds.

It is not always necessary or possible for a crystalline substance to show plane faces and well formed interfacial angles. Growth may have been so rapid that skeletal forms resulted. For example, if snow flakes were well formed they would be flat, smooth, six-sided plates or tablets. However, snowflakes grow rapidly along the three axes of the hexagonal lattice and fill in only incompletely between the axes. Many crystalline materials are not well formed because growth is constrained by the shape of the container during crystallization, by other growing crystals, or by other foreign materials. Crystals of metals such as brass or aluminum grow until they contact other growing neighboring crystals. Table salt often forms into flat hopper shapes because crystallization occurs on the surface of a solution.

The presence of a regular geometric shape is not a necessary prerequisite for a crystalline substance. A newly uncovered diamond usually looks like a piece of broken glass and takes on a crystal form only when carefully cleaved along the proper crystal planes (see Diamond). Other materials may partially crystallize in the sense that they do not have a completely ordered arrangement of lattice points. Nylon and rubber are good examples of this type of crystalline material. Both rubber, when stretched, and nylon, after stretching, are almost completely crystalline.

Properties of Crystals

Crystals possess unique physical properties because of the internal arrangements of lattice points. Except for crystals in the cubic system, physical properties of a given crystal vary with direction in the crystal. The refractive index, hardness, coefficient of expansion, heat conductivity, electrical resistance, and light absorption or color vary with the direction in the crystal along which the measurement is made. Crystals which show this variation are anisotropic in contrast with cubic crystals and amorphous substances which are isotropic. See Absorption; Conduction, Heat; Expansion; Light, Wave Motion, *Refraction.*



CHICAGO NATURAL HIST. MUS.

Hexagonal crystals of calcite. More than one thousand different forms and combinations of calcite crystals are known, all of which are soft and easily dissolved in acid.

Crystals in the cubic system have one index of refraction regardless of how the crystal is oriented for the measurement. For example, table salt has a refractive index of 1.544. Uniaxial substances crystallizing in the tetragonal or hexagonal systems possess two principal refractive indexes; quartz has two possible indexes of refraction, 1.553 when measured along the *c* axis and 1.544 when measured in a plane perpendicular to the *c* axis. Biaxial crystals belonging to the orthorhombic, monoclinic, and triclinic systems have three refractive indexes. Such crystals will show all possible intermediate refractive indexes when measurements are made at varying angles from the *c* axis.

Crystals which are anisotropic in most of their physical properties are further divided into anisotropic and isotropic groups depending upon the manner in which the optical properties vary with direction. All crystals in the tetragonal and hexagonal systems behave similarly in that, although anisotropic in other respects, they possess a single isotropic plane. Since the measurement of refractive indexes is easily made and is different for each substance, the indexes form valuable identifying characteristics.

The hues of colored anisotropic substances may also vary with direction. The mineral tourmaline, for example, is black for light waves parallel to one axis and nearly colorless for light waves perpendicular to the first direction. This phenomenon is pleochroism. Many of the rare earth salts also show this property when examined with polarized light (see Rare Earths). Another interesting and important property of such crystalline substances as quartz, ammonium dihydrogen phosphate, and Rochelle salt is piezoelectricity. Crystals showing this property actually develop a difference in potential at their opposite ends when subjected to pressure. The reverse can also occur: subjecting the crystal to an electrical potential along the *c* axis will cause a change in dimensions of the crystal.

Many substances exist in two or more different crystalline arrangements or structures. This property of multiple arrangement is polymorphism. Both graphite and diamond, for example, are chemically pure carbon; yet one is black and soft and the other white and hard (see Diamond; Graphite). Other substances also showing this ability to crystallize in two or more structures include monoclinic and rhombic sulfur, quartz and cristobolite, and calcite and aragonite. Water possesses eight different crystal structures, depending on the temperature and pressure. Usually, however, only one structure is stable under a given set of conditions, and a given polymorphic form may transform spontaneously to a more stable form if conditions are changed. A diamond, if heated, will change to graphite, and monoclinic sulfur will slowly change at room temperature to the stable rhombic form. Since the physical properties of the new forms are usually different from the original ones, the transformation results in complete disintegration of the original single crystal into a polycrystalline aggregate of the new form. Such a change can sometimes be useful in reducing particle size without the need for grinding. This transformation procedure is used in the manufacture of certain cements in order to reduce the particle size of its calcium silicate.

The growing importance of crystallography as a major field of science lies in the relationship between internal structure, external form, and the physical properties of solid substances. The hardness, tensile strength, ductility, and wearing ability of alloys is directly related to the crystal structure of those alloys. Similar relationships exist for abrasives, structural materials, natural and synthetic fibers, and paint pigments. The study and understanding of the crystal properties of these substances make possible the improvement of physical properties and performance. Consideration of crystal properties has also yielded more soluble and more active drugs; smoother, tastier

ice creams and other food products; improved alloys; gem stones of greater brilliance than the diamond; stronger cements and mortars; more durable synthetic fibers; and more powerful high explosives. Transistors, small single crystals used in place of regulation vacuum tubes in electronic devices, are a direct result of the application of crystallography in research (see TRANSISTOR; METALLURGY).

WALTER C. MCCRONE

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CRYSTALLOID is a minute crystalline substance, which in solution will pass through vegetable parchment or animal membrane in dialysis (see DIALYSIS). Unlike a colloid (see COLLOID), a crystalloid will not enter into dialysis. Metallic salts, sugar, and oxalic acid are typical substances that act as crystalloids in solution. Minute portions of protoplasmic substances in cells assume the form of hygroscopic crystals (crystals that absorb and retain water) that diffuse through membrane. Such substances, which act as a vehicle for coloring matter, are often found in oily seeds. There are substances, such as gold and gold salts, plus a number of proteins, that will crystallize in solution, but nevertheless act as colloids and will not diffuse through a membrane.

CRYSTAL MOUNTAINS. See BELGIAN CONGO; FRENCH EQUATORIAL AFRICA.

CRYSTAL PALACE, a famous exhibition hall constructed for the great Industrial Exhibition at London, 1851. Built entirely of glass over an iron framework, the structure was designed by Sir Joseph Paxton and was originally erected in Hyde Park. After the exhibition it was dismantled and re-erected, 1854, at Sydenham, where it became a popular tourist attraction. Before its almost total destruction by fire in 1936, the Crystal Palace was used to house the Imperial War Museum.

CSABA. See BEKESCSABA.

CSENGERY, ANTON, 1822–80, Hungarian journalist, was born in Nagyvárad. He is, with Baron Sigismund Kemény, considered the founder of Hungarian journalism, and was active in several radical political and literary movements before the Hungarian Revolution, 1848. After the defeat of the revolutionists and the emergence of Ferencz Deák as a national leader, Csengery became a personal attaché of Deák and was largely responsible for writing many important state documents.

CSEPEL, town, N central Hungary, on the N end of Csepel Island; 6 miles S of Budapest. Csepel has iron, steel, and aluminum mills; factories producing motors, munitions, airplanes, and textiles; and petroleum refineries. Pop. about 50,000.

CSIKY, GERGELY or **GREGOR,** 1842–91, Hungarian dramatist, was born in Pankota. He was educated at the Roman Catholic Seminary at Temesvár, where he became a priest and later taught. In 1875 he entered his first play, *Jóslat* (Prophecy), won a prize in competition and was a great success. Thereafter he devoted most of his time to writing, and many of his later plays were prize winners which brought a warning from his superiors to cease such worldly activity; Csiky promptly left the priesthood, became a Lutheran, and married. Csiky's writing is sharply realistic and accurately reflects the Hungarian social scene of his day; most of his plays were popular and continued to be performed long after his death. Among them are *A proletárok* (The Proletariat), and *Cifra Nyomoruság* (Pretty Poverty).

CSOKONAI, VITEZ MIHÁLY, 1773–1805, Hungarian poet, was born in Debreczen and was for a time professor of poetry in the college there. He derived his inspiration from the folk songs of Hungary and made a valuable contribution to the development of national Hungarian poetry in such works as *Dorottya* (1804), a mock-heroic epic.

CSOMA DE KÖRÖS, ALEXANDER, 1784–1842, Hungarian philologist, was born at Körös, in Transylvania. He set out in 1820 for the East, with the intention of tracing the history of the Magyars, who, he was convinced, had originated in Central Asia. Csoma disguised himself as a Near Easterner and spent four years in a Buddhist monastery, but failed to find the link he sought. He did, however, become famous for his studies on Tibetan language and literature and published a Tibetan-English Dictionary (1834).

CSONGRÁD, city, S Hungary, in the county of Csongrád, at the junction of the Tisza and Körös rivers, 75 miles SE of Budapest. Csongrád is the communications and market center for an agricultural region. Industries include the manufacture of food products, lumber, and bricks. Pop. 24,660.

CTENOPHORA, a phylum of about 80 species of free-swimming, marine, invertebrate animals. (See CLASSIFICATION OF LIVING THINGS.) Ctenophores have eight rows of ciliary comb plates which are used for locomotion. They exhibit both radial and bilateral symmetry and closely resemble the true jellyfish in appearance (see JELLYFISH). Certain species are iridescent and others are luminescent. All of the known species are hermaphroditic, that is, both eggs and sperm are produced by the same individual. The mature sex cells are discharged from the mouth and fertilization takes place in the water. Ctenophores are usually found in surface waters where they feed on mollusk and crustacean larvae, fish eggs, and small fishes. The members of this phylum include the 3-inch-long comb jellyfish, *Mnemiopsis leidyi*, and the spherical sea walnut, *Pleurobrachia pileus*, about three-quarters of an inch in diameter. Venus' girdle, *Cestum veneris*, is a brilliantly colored tropical species that swims with graceful body movements.

CTESIAS, of Cnidus in Caria, a Greek physician and historian of the sixth century B.C., who wrote a history of the Persian nation, *Persica*, a work which professed to correct the account of Herodotus. Ctesias was physician of the Persian king, Artaxerxes Mnemon, and lived at his court for 17 years. Unfortunately only fragments of his historical work have survived. Ctesias also wrote a treatise on India.

CTESIBIUS, Greek physicist of the second century B.C., who is credited with discovering the expansive power of air. Using this discovery he devised a force pump and syphon; he also invented a water clock, a fire extinguisher, and a hydraulic organ.

CTESIPHON, ancient city, capital of the Parthians and the Sasanids, located in what is now Iraq, on the Tigris River, 25 miles SE of Baghdad. A Parthian camp established opposite the Hellenistic city of Seleucia, Ctesiphon about 129 B.C. became the winter residence of the Parthian kings. It was taken by Trajan in his Parthian campaign of 115–116, and again by Septimius Severus in 198. It was the Sasanid capital from about 226 (see SASANIDS). Near Ctesiphon the emperor Julian defeated the Persians in 363. The city fell to the Arabs in 637. There are noted ruins of the Sasanid palaces. See PERSIA.

CUANZA RIVER or **COANZA,** also Kwanza, SW Africa, central Angola, rises on the Bihé, Plateau, flows NNW and W to the Atlantic Ocean 35 miles S of Luanda. The river has a total length of some 600 miles and is navigable for small vessels below Dondo, about 120 miles from the ocean. The upper sections of the river contain numerous waterfalls and cataracts.

CUAUTLA or **CUAUTLA MORELOS,** city, S central Mexico, in the state of Morelos, on the Mexican National Railway, 45 miles SSE of Mexico City. Cuautla, a popular resort, is on the south slope of the Central Plateau at an elevation of 4200 feet. The town is famous for the successful three months' defense conducted by José María Morelos against superior Spanish forces in the War of Independence (1811) and as the headquarters of Emiliano Zapata's guerrillas during the Mexican Revolution (1911–19). Pop. (1950) 9779.

CUBAN CONSULATE

CUBA

The "Pearl of the Antilles" leads the world in sugar production and is rich in minerals.

CUBA, island and republic (including the Isle of Pines), westernmost of the West Indies and Greater Antilles, largest island in the Caribbean area, located at the entrance to the Gulf of Mexico, separated from Florida to the N by the 90-mile-wide Straits of Florida, from the Bahamas to the NE by the Bahama channels of the Atlantic Ocean, from Haiti to the E by the Windward Passage, from the Yucatán Peninsula of Mexico to the SW by the Yucatán Channel, and bordered on the S by the Caribbean Sea; area of the island 44,164 sq. mi.; republic 46,748 sq. mi.; pop. (1953) 5,829,029. Cuba is long and narrow and gently curved from west to east. Cape San Antonio, the most westerly point, is about 700 miles from Cape Maisí, the most easterly. The average width of Cuba is only 50 miles. One of the first places in the New World visited by Christopher Columbus and one of the last Spanish colonies to gain independence, Cuba has long been noted for sugar and tobacco. For the Cuban national flag in color, see FLAG.

PHYSICAL FACTORS

Geology and Topography. The island of Cuba is formed essentially of foundation beds of ancient igneous and metamorphic rocks overlain by extensive deposits of Tertiary limestone. Coralline limestone occurs around the coasts. About three-fourths of Cuba consists of level or gently sloping plains with mountains in the eastern, central, and western sections. The major or highland area is the Sierra Maestra of eastern Cuba, which includes the peak Turquino (5610 ft.), the highest point on the island. The low central range, the Sierra de Trinidad, has no peaks above 4000 feet. The western ranges are little more than hills.

Coasts and Rivers. Cuba has irregular and much indented coasts with numerous bays, lagoons, and islands, including many coral isles. Major island groups include the Sabana and Camagüey archipelagoes off the northern coast, the Jardines de la Reina to the south, Los Canarreos and the relatively large Isle of Pines to the southwest, and Los Colorados to the northwest. A feature of the Cuban coast line is the large number of fine natural harbors, notably those of Havana, Santiago de Cuba, and Guantánamo. Low, marshy coasts occur along much of the Caribbean side of Cuba with cliffed coasts general on the north side of the island.

Coat of Arms of Cuba

Rivers are numerous. The island has an east-west divide, causing most of the streams to flow generally north or south. In consequence most of the rivers are short with the exception of the Cauto in the southeastern part of Cuba.

Climate. Cuba has a tropical climate with temperatures moderated by the cooling effects of the northeast trade winds. Marine influences are dominant with temperatures generally equable and humidity usually high. The average annual temperature at Havana is 77°F with the January average about 70°F and the July average around 80°F. Two distinct seasons are experienced, a dry, relatively cool period from November to April and a warmer, rainy season from May to October. Average annual precipitation at Havana is about 45 inches. Slightly more humid conditions occur in the extreme western section. Destructive hurricanes periodically strike the island, particularly in the west.

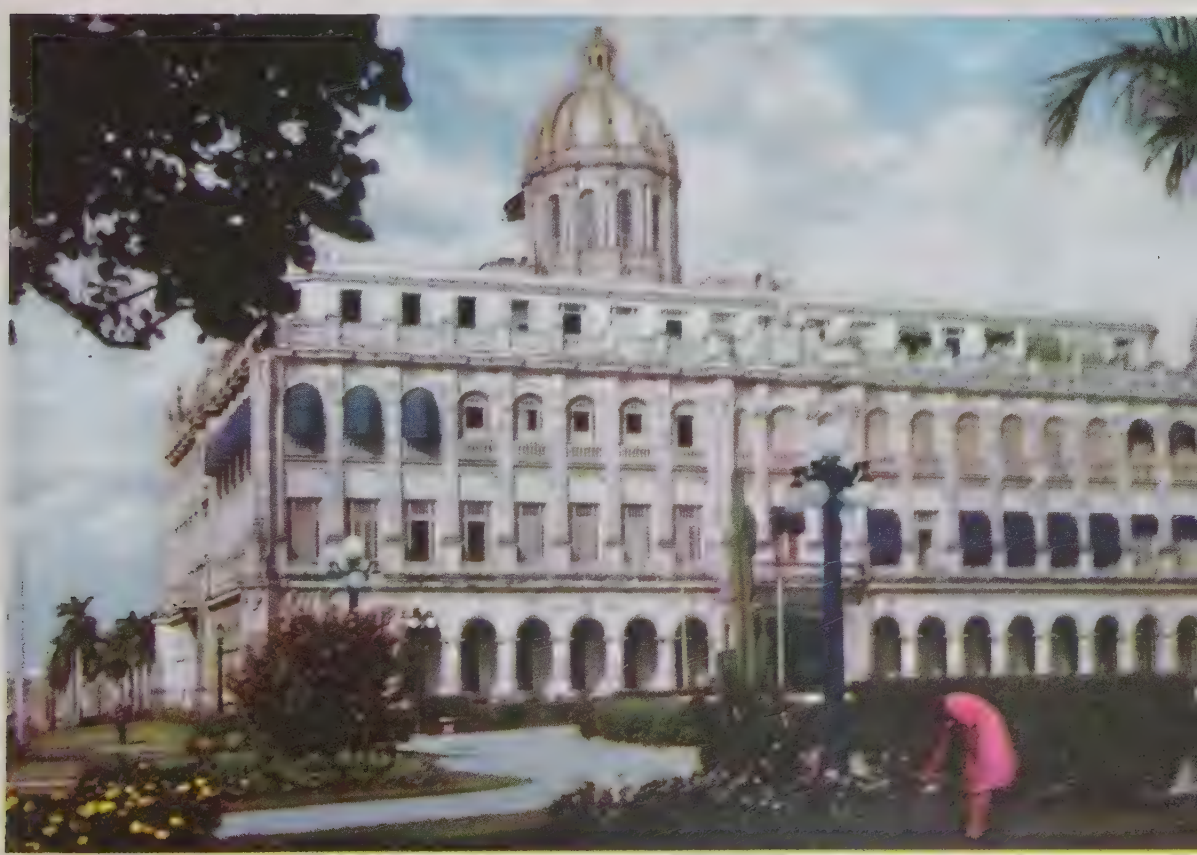
Soils and Natural Vegetation. Alluvial soils cover most of the lowland portions of Cuba and weathered limestone occurs in the highlands. Natural soil fertility is generally high. Fertile soils, warmth, and abundant moisture have produced a luxuriant and varied vegetation. Dense forests formerly covered most of Cuba but extensive forest clearance for agriculture has reduced the forested area to about a sixth of the island. The remaining forests include palms, cedars, and tropical hardwoods. The majestic royal palm is the most characteristic Cuban tree. There are numerous other tree species, among them dyewoods and medicinal, resin, and gum trees. Pines flourish in the western section of Cuba and mangroves fringe the southern coast.

Animals. Rabbits, rats, and mice are common on the island. Hogs, cats, and dogs live in a wild state.

Location Map of Cuba

Morro Castle, the Spanish fort commanding the entrance to Havana, dates from 1590 and survives as a high light in tourists' itinerary of Cuba

The Capitol Building stands in the heart of Havana as a symbol of the island's democracy and a display of architectural grandeur



The Presidential Palace, residence occupied by the head of the Republic of Cuba, is located in the central part of Havana, looking toward the city's harbor. The president's home office on the second floor of the building may be reached by a splendid staircase or by modern elevators

JANET, PIX; PAN AMERICAN WORLD AIRWAYS

Fishing provides an important item in domestic food consumption and adds another product, sponges, to Cuba's list of exports

Sugar is Cuba's most important agricultural crop. Although most of it is exported raw, the refining of sugar forms Cuba's largest manufacturing industry

Coffee Production is not based on the familiar plantation system. Cultivation by small growers has resulted in the product's becoming an important export

The Yumari Valley in the province of Matanzas is one of the most beautiful valleys in Cuba. Located on the northern coast of the island, the area has the typically warm, humid climate of the tropics. The region has agricultural importance in that it supports extensive cultivation of cane sugar

BLACK STAR; JAMES SAWDERS, COMBINE

THREE LIONS

Carnival Dancer

CUBAN TOURIST COMM.

Cuban Negroes celebrate a fiesta by dancing the *comparsa* "Las Guaracheras."

CUBAN TOURIST COMM.

Cuban Cigar Maker

CUBAN TOURIST COMM.

Workers in a Havana factory strip tobacco leaves for cigar manufacture.

THREE LIONS

Beach Artisan

CUBAN TOURIST COMM.

Ringed by mountains, Santiago area is often called "Tropical Switzerland."

SUGAR RESEARCH FOUNDATION, INC.

Sugar Cane Harvester

CUBAN TOURIST COMM.

Workers load an oxcart with sugar cane in preparation for the trip to the mill.

CATERPILLAR TRACTOR CO.

Yoked cattle, once Cuba's basic source of power in the sugar cane fields, rest as a tractor pulls loaded carts from the field to the transfer station at a rail siding.

A few deer are found in remote sections. Bats are numerous and more than 20 species occur. Many reptiles occur in Cuba, including tortoises, caymans, crocodiles, and lizards. Snakes are not abundant and none are venomous. There are numerous birds, especially terns, ducks, gulls, and many water birds that are native to the southeastern United States. Nightingales, orioles, finches, hummingbirds, and warblers are also found. Cuban waters are extremely rich in fish and the manatee, or sea cow, inhabits river mouths.

Social and Economic Factors

Population. The aboriginal Indians of Cuba were so rapidly wiped out by the early Spanish that a large mestizo (Indian and white) population never developed. The majority of the inhabitants are descended from white settlers, mainly Spanish. There are also large Negro and mulatto (Negro and white) minorities. Some of the Negro Cubans are relatively recent immigrants from Haiti, Jamaica, and other parts of the West Indies. A small Asian element, principally Chinese, makes up about 1 per cent of the population. Spanish is the language in general and official use although English is widely spoken.

Religion and Education. Roman Catholics form an overwhelming majority of the population of Cuba. No church is maintained by the state and religious freedom is extended to all.

Although education is free and compulsory between the ages of 6 and 14 educational facilities are not everywhere available. Consequently, many school age children do not attend school and the illiteracy rate is believed to be increasing. The state maintains secondary, normal, and vocational schools in all provinces. Private schools play an important role in primary and secondary education. Higher education is provided by the University of Havana (founded 1728 and twice closed down in the 1930s because of political disorders), Oriente University (founded 1947) at Santiago de Cuba, Central University of Los Villas (founded 1948) at Santa Clara, and the Catholic University of Saint Thomas of Villanova (founded 1946) at Havana. There are also numerous colleges and technical institutions.

Agriculture. Cuba's fertile soils, extensive level land suitable for mechanized cultivation, and favorable climate have made agriculture the leading occupation. Sugar is far and away the most important crop and Cuba ranks as one of the world's major producers of cane sugar. The provinces of Havana, Matanzas, Las Villas, and Oriente are the main sugar cane areas. Cuban agriculture for many years consisted largely of sugar monoculture but recent government efforts to diversify cropping have met with moderate success. Other major crops are tobacco, notably in the Vuelta Abajo district of Pinar del Río; coffee, principally in Oriente; rice, notably in the province of Pinar del Río; corn; bananas; plantains; vegetables; henequen; pineapples; cacao; and citrus and other fruits. Out-of-season vegetables for the North American market are important. Cattle, hogs, and sheep are the principal livestock, together with horses, mules, oxen, and goats. Beekeeping is widespread.

PRINCIPAL CITIES

	Population 1943 Census	1953 Census
Havana	659,883	785,455
Marianao	120,163	219,278
Santiago	118,266	163,237
Camagüey	80,509	110,388

Forestry and Fisheries. The province of Camagüey is the main forested area of Cuba. Valuable hardwoods include mahogany, rosewood, ebony, and cedar. Charcoal for fuel is important. Resins, gums, dyewoods, fibers, and other forest products are of minor value.

Cuba has excellent year-round fishing in coastal waters for numerous food and game fish, together with shrimps, lobsters, and oysters. Sponge fishing is important, particularly on the southern coasts. Deep sea fishing is carried on from the larger ports.

Mining. The Sierra Maestra is the principal mineral-producing area, possessing rich deposits of nickel, iron, copper, manganese, and chromium. Other mineral products are coal, asphalt, barite, gold, silver, and stone. Petroleum is produced in the province of Havana. Most of the domestic consumption of salt is supplied from plants obtaining salt from coastal pools.

Manufacturing and Commerce. The processing of sugar, the major industry, is carried on in more than 150 sugar mills. About half the sugar capacity of the mills is United States owned. Processing other agricultural produce is generally important. Major manufactures include tobacco products (among them the famed Havana cigars), rum and other beverages, alcohol, wood products, textiles, leather, cement, and construction materials. Havana is the principal industrial center of the republic.

Cuba is closely linked with the United States in trade. The United States supplies more than half the Cuban imports, and takes more than three-fourths of the exports. Other leading trading partners of Cuba are Great Britain, Germany, and Japan. Sugar, in one form or another, is the principal export item and makes up about 90 per cent of the value of Cuban exports. Most of the sugar goes to the United States under a preferential tariff arrangement. Tobacco is the second most valuable export commodity. Leading imports are foodstuffs, machinery, and mineral products.

Communications. Cuba has about 3000 miles of public railroads in operation, running from east to west with branches serving the major ports. In addition, there are about 8000 miles of private lines, mainly serving the large sugar estates. The island has more than 2000 miles of highways, including the Central Highway, which runs almost the length of Cuba. All the major urban centers have airports, with Havana the hub of the main international services. The island is remarkably well supplied with good harbors. Leading seaports are Havana, Matanzas, Nuevitas, Cárdenas, Guantánamo, Cienfuegos, and Santiago de Cuba.

Tourist Attractions. The agreeable tropical climate, fine beaches, fishing, and the great interest of Cuba attract many visitors. The proximity to the United States and the development of excellent tourist facilities have made Cuba particularly popular with North American visitors. Consequently catering to tourists is an important Cuban industry.

CUBA

CUBAN CONSULATE

Havana's Maternity Hospital is one of 35 such institutions maintained under the government's social security program.

Typical of peasant homes throughout the West Indies is this thatched, earth-floored hut or *bohio* in rural Cuba.

PAUL GUILLUMETTE, INC.

CUBAN TOURIST COMM.

Picturesque Hanabanilla Falls is one of the loveliest tropical scenes along the island's short and rapid streams.

Cuban sisal workers take time out for coffee. The fiber, derived from West Indian agave, is used in rope and twine.

CUBAN CONSULATE

Guitars and maracas interpret the Latin American rhythms that appeal to tourists as well as the Cubans.

CUBAN TOURIST COMM.

CUBAN TOURIST COMM.

Mule-drawn wagons mingle with automobiles on one of the side streets of Havana. Such scenes are commonplace in the city's old section, built in the sixteenth century.

Administrative Factors

Government. Cuba has a republican form of government with a president, vice-president, senate, and house of representatives. The constitution, drawn up first in 1901 along the lines of the United States constitution, was modified in 1935 and redrafted in 1940. The president is elected for a four-year term by direct voting. There is also a premier, appointed by the president but responsible to the house of representatives. The chief executive is assisted by a cabinet which is responsible to congress and must resign in the face of a vote of no confidence. Senators number 54 and members of the house of representatives total 140. Members of the upper house serve six-year terms and those in the lower house serve four years. All men and women over 21 must vote. The republic is divided for administrative purposes into six provinces, each with an elected governor, and more than 100 municipalities.

POLITICAL DIVISIONS

PROVINCES	Area Sq. Miles	Population 1943 Census	Population 1953 Census
Camagüey	10,064	487,701	619,256
La Habana (Havana)	3,170	1,235,939	1,538,803
Las Villas	8,257	938,581	1,030,162
Matanzas	3,256	361,079	395,780
Oriente	14,211	1,356,489	1,797,606
Pinar del Río	5,206	398,794	448,422
Total	44,164	4,778,583	5,829,029

Armed Forces. The Cuban army numbers about 15,000 and there is also a naval force with several small vessels. Small air detachments are maintained by the air force and navy. In 1952 Cuba entered into a military assistance pact with the United States. Under the terms of a previous agreement, in 1903, a naval base is leased by the United States at Guantánamo Bay.

History

Colonial Period. Cuba was discovered by Christopher Columbus on his first voyage to the New World in 1492. Columbus found Cuba inhabited by unwarlike Arawak Indians and he believed it to be part of the mainland. Several years later, in 1508, Sebastián de Ocampo established the fact that it was an island. After being called by several Spanish names the island came to be known by its original Indian name of Cuba. The Spaniards quickly explored Cuba and in 1512 Diego de Velásquez founded a settlement at what is now Baracoa. Other settlements were established by Velásquez in 1514 at Santiago de Cuba and Trinidad. A colony, settled on the southern coast, known as San Cristóbal de la Habana was moved in 1519 to the site of present-day Havana (Habana). The early Spanish settlers enslaved the aboriginal Indians, causing their virtual elimination through abuse and disease. Lacking Indian slaves to provide labor, the Spaniards imported great numbers of Negro slaves from Africa.

The early history of the Cuban colonies was turbulent. Havana developed as the center for dispatch of the great treasure fleets to Spain, inviting attack from buccaneers and others. It was raided and severely damaged on many occasions by French, British, and Dutch forces. Cuba remained in Spanish control, however, except for the period 1762–63 when it was held by a British fleet.

Spain at first regarded Cuba as a potential source of precious metals but, when these were not forthcoming, an agricultural economy was developed. Sugar cultivation was introduced in the late eighteenth century and the crop soon assumed dominant importance in the island's economy. Excessive dependence on a single crop made Cuba prone to recurrent slumps when the market price of sugar was low. Widespread hardship was experienced during the periods of depression. In general, the Spanish colonial rule, under autocratic captains-general, was feudalistic and harsh. Restrictions, designed to promote Spanish interests, hindered the development of Cuba.

Independence Movement. For Cubans the nineteenth century was a period of mounting dissatisfaction with their colonial status and tyrannical government. Discontent became acute by mid-nineteenth century and a series of risings against the Spanish authorities was repressed with great severity. In 1868 the Cubans rose in revolt against Spain under the leadership of Carlos Manuel de Céspedes. The following year the Cuban insurrectionists proclaimed Cuba an independent republic under the presidency of Céspedes. The Spanish made vigorous efforts to quell the rising but civil war raged for 10 years, until 1878. The struggle was marked with terrible excesses on both sides and was finally terminated by a treaty that promised numerous reforms, including some representative government and the abolition of slavery. The promised reforms only slightly changed the character of the colonial regime and did little to remove the grievances of the Cuban people. However, gradual elimination of slavery began in 1880 and final abolition came in 1886.

Discontent still rankled and the demand for independence became more insistent. Civil war again broke out in 1885 under the same leaders as in 1868–78, including the poet José Julian Martí, Máximo Gómez y Báez, Antonio and José Maceo, Calixto García y Íñiguez, and Bartolomé Masso. The war was accompanied by much bloodshed and many Cubans died from starvation in concentration camps. In an attempt to meet some of the insurgents' demands the Spanish authorities granted limited autonomy to Cuba. This concession did not satisfy the revolutionaries and in 1895 the fighting flared up with renewed vigor.

In 1898 the United States battleship *Maine* was sent to Havana for the protection of American interests threatened by the war. Soon after arrival at the Cuban capital the *Maine* was mysteriously blown up. Public opinion in the United States was aroused by the incident and in April 1898 the U.S. Congress passed a resolution that declared for the independence of Cuba and demanded the withdrawal of Spanish forces from the island. War with Spain followed (see

Spanish-American War). The hostilities lasted only a few months and Cuba was officially taken under American military protection at the beginning of 1899. Although United States control was resented by many Cubans, a number of governmental reforms were instituted and important progress was achieved in health and hygiene.

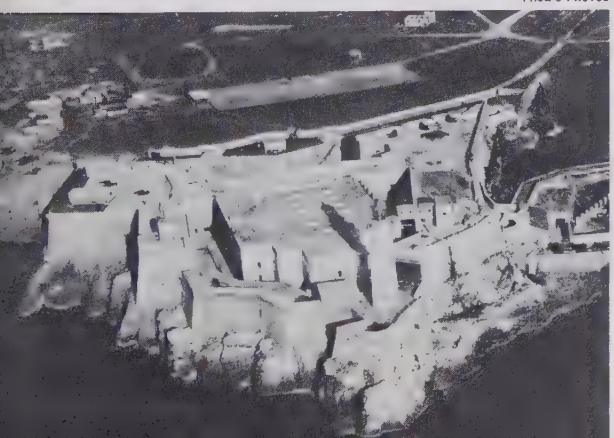
Independence. In 1901 Cuba adopted a constitution modeled along the lines of that of the United States and in 1902 elected Tomás Estrada Palma as the first president. The constitution incorporated certain conditions, known as the Platt Amendment, which placed Cuba under U.S. suzerainty. The independent Cuban government was formally installed in 1902 and the new republic enjoyed considerable prosperity in its early years. However, the Palma regime was unsatisfactory to some Cubans and revolution again broke out in 1906 after charges of election fraud. In response to requests from President Palma for United States aid, U.S. Marines were landed at Havana. The administration of Cuba was assumed by the United States under the governorship of William Howard Taft and later Charles Edward Magoon.

The American period of rule lasted three years and, after constitutional changes designed to increase administrative stability had been made, authority was restored to the Cubans in 1909. Heading the second Cuban republic was President José Miguel Gómez who remained in office until 1913. The Gómez era was marked by political corruption, although the period was one of economic prosperity and a number of useful public works were carried out. In 1913 Mario García Menocal replaced Gómez and remained chief executive until 1921. Menocal's administration survived a revolution in 1917 led by former president Gómez. During Menocal's presidency Cuba enjoyed great prosperity because of highly favorable market conditions for sugar. After World War I the sugar market collapsed and caused a major financial crisis in Cuba. The finances of the republic were saved by a substantial loan from the United States.

In 1921 Alfredo Zayas y Alfonso became president and in 1925 the presidency was assumed by Gerardo Machado. Machado attempted to improve the country's economic position by restricting sugar production, fostering other forms of agriculture, and by a program of public works. Machado arranged for the presidential and congressional terms of office to be extended but was opposed by the supreme court in his tampering with the constitution. However, Machado received dictatorial powers from congress and governed without regard to the constitution. Meanwhile the economic position of Cuba had worsened, distress was widespread, and the Machado regime was discredited. Finally in 1933 a general strike and rioting, in which students played a prominent role, forced Machado to flee the country.

Morro Castle, a once mighty fortress guarding Havana's harbor from pirates, is a noted relic of the past. Other Morro Castles are at San Juan, P.R., and Santiago de Cuba.

PAUL'S PHOTOS



Carlos Manuel Céspedes y Quesada was appointed provisional president to succeed Machado but was almost immediately overthrown by a military revolt. The military set up a revolutionary junta headed by Ramón Grau San Martín but disorder continued and the Grau government fell early in 1934. It was replaced by an administration under Carlos Mendieta, who received United States official recognition, denied to Grau. Other nations also acknowledged the Mendieta government. Another significant occurrence in 1934 was the abandonment of United States guardianship over Cuba although the American possession of the naval base at Guantánamo Bay was confirmed.

Order was gradually restored to the republic by Mendieta, and his army chief Fulgencio Batista became virtual dictator of Cuba and exercised his control through a series of presidents. In 1940 a new constitution was adopted and Batista was elected to the presidency. Toward the end of 1941 Cuba signed an alliance with the United States, later declaring war on Japan and the Axis powers.

After an orderly campaign, Ramón Grau San Martín was elected president in 1944. He was succeeded in 1948 by Carlos Prío Socarrás. Prío Socarrás announced a far reaching program of reforms but violence and charges of corruption continued to mar Cuban political activity. The post-World War II period was generally one of economic prosperity, with sugar production at a high level. A record sugar crop—about 8 million tons—was harvested in 1952. In 1952 a military rising brought about the downfall and exile of Prío Socarrás. Former president Fulgencio Batista again assumed charge of government as provisional president and embarked on a program of developing industry, agriculture, and public works. An unsuccessful revolt against Batista was staged in 1953. Ramón Grau San Martín began a campaign against Batista in persidential elections held in 1954 but withdrew, leaving Batista to be returned unopposed.

Per capita income in Cuba in 1955 was one of the highest among the world's tropical countries. Nevertheless, unemployment was widespread and discontent was reflected in an unsuccessful uprising against the Batista regime in the spring of 1956 led by Fidel Castro. Castro's forces were still fighting in 1957.

See Batista, Fulgencio; Céspedes y Quesada, Carlos Manuel de; Columbus, Christopher; García y Iñiguez, Calixto; Gómez, José Miguel; Gómez y Báez, Máximo; Machado, Gerardo; Martí, José Julian; Platt Amendment.

Bibliog.–C. Beals, *Crime of Cuba* (1933); H. Strode, *Pageant of Cuba* (1934); D. A. Lockmiller, *Magoon in Cuba* (1938); O. G. Gibson, *Isle of a Hundred Harbors* (1940); C. K. Hermer, and M. May, *Havana Mañana* (1941); E. Fergusson, *Cuba* (1946); F. Ortiz-Fernández, *Cuban Counterpoint: Tobacco and Sugar* (1947); L. Nelson, *Rural Cuba* (1950); E. A. Chester, *Sergeant Named Batista* (1954); S. A. Clark, *All the Best in Cuba* (ed. 1954).

CUBANGO RIVER or **KUBANGO,** also Okovanggo, Okovango, or Okavango, SW Africa, rises in central Angola on the Bihé Plateau, flows S and SE, then E to form part of the frontier between Angola and South-West Africa, and SE into N Bechuanaland to the Okovanggo Basin. The river has a total length of about 1000 miles. It is generally known as the Cubango in Angola and as the Okovanggo in its lower section. The river has no outlet to the sea but discharges into the internal drainage area of the Okovanggo Basin with some of its flow reaching Lake Ngami.

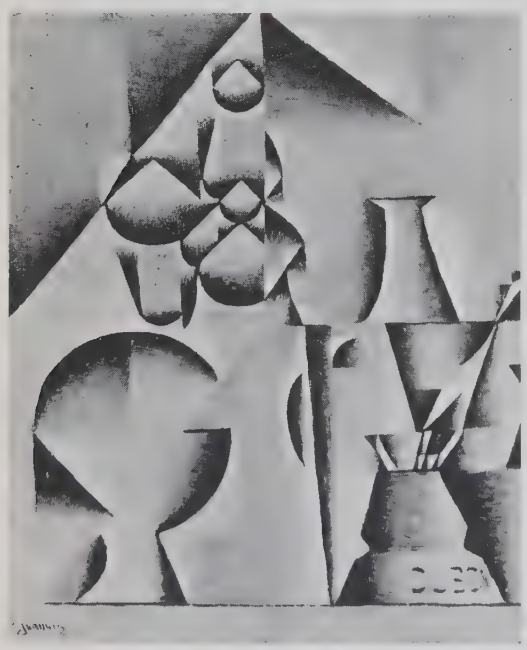
CUBATAO, city, SE Brazil, in the state of São Paulo, at the foot of Serra do Mar, about 7 miles WNW of Santos. Cubatão is the site of a hydroelectric plant that supplies electric power to São Paulo and Santos. Industries include paper mills, an oil refinery, and the manufacture of chemicals. Pop. (1950) 6552.

CUBE, a three-dimensional geometric figure bounded by six equal square plane faces, the opposite

sides being parallel to each other. It is the special case of a parallelepiped (see PARALLELEPIPED) whose edges and angles are all equal. If a represents the length of one edge, the volume V is $a \times a \times a$, or $V = a^3$. If the volume is known, the edge is determined by finding the cube root of the number measuring the volume, or $a = \sqrt{V}$. If the edges are doubled in length, the volume is increased eightfold. (See POLYHEDRON; MENSURATION.) One of the three famous problems of the ancients was to find, by means of straightedge and compass, the edge of a cube that would have double the volume of a given cube. This is equivalent to finding the cube root by 2 of geometric construction, an impossibility under the conditions given; it can be done, however, by using simple instruments other than the compass and straightedge. See EXPONENT; POWER AND ROOT; EQUATION, *Cubic Equation.*

CUBEB, or cubeb pepper, is the dried unripe fruit of the East Indian plant *Piper cubeba*, family *Piperaceae* (see PEPPER). Cubeb plants are treelike or climbing, depending upon the availability of proper climbing support. The peppers are small oval fruits about 4 to 5 millimeters in diameter and are blackish gray in color; they were once used medicinally in the manufacture of throat lozenges.

CUBIC MEASURE. See WEIGHTS AND MEASURES.



ART INST. OF CHICAGO

***La Table du Café*, an abstraction in gray by Juan Gris. His analytical cubism, of which this is an example, later gave way to what came to be known as synthetic cubism.**

CUBISM, a technical and aesthetic revolution in European art, 1907–14. Centered in Paris, the movement had as its leaders the Spaniards Pablo Picasso and Juan Gris, and the Frenchmen Georges Braque and Fernand Léger. Cubism greatly influenced the majority of painters in the lively epoch preceding World War I, and subsequently affected (at least indirectly) all Western painting. *Cubism* was initially used derisively, probably appearing for the first time in a critical notice of a 1908 Braque exhibit. A year earlier Picasso had painted the *Demoiselles d'Avignon* (now in the Museum of Modern Art, New York), a key painting in art history because it is generally considered to be the first cubist painting: the right half of the work is based on design alone (with suggestions of the African masks just then becoming known), and the painting is devoid of chiaroscuro. Precursors of the revolution, or elements in the ambient out of which cubism grew, include the discovery by Europeans of African Negro sculpture and the so-called primitive arts, the Georges Seurat retrospective exhibit in 1905, and the Paul Cézanne retrospective in 1907. Cubism itself is chronologically divisible into three phases: a Cézannesque period, 1907–09; an analytic phase, 1910–12; and a synthetic phase, 1913–14.

In 1907 Picasso and Braque established a close working relationship. In the same year the German art dealer Daniel Kahnweiler opened a gallery in Paris which was to serve as the sanctuary of the cubist group. In 1908 the famous "Bateau-Lavoir group" (the name deriving from the tenement where Picasso, Gris, and the writer Max Jacob lived) began the discussions out of which evolved the philosophy of the movement. Held in the Bateau-Lavoir and surrounding cafes, these meetings included all the cubist leaders and, in addition, Henri Matisse and André Derain, who were working along parallel lines in developing the aesthetics of twentieth century art by imposing discipline on the wild colors of Fauvism, and by methodically organizing the painted surface. Gertrude Stein and Guillaume Apollinaire, poet and publicist of the movement, were also present. Such diverse individuals as Jean Cocteau and the Mexican, Diego Rivera, were intermittent visitors.

SMITH COLLEGE MUS. OF ART

***La Table*, a still life in geometrical design, executed by Picasso, much-imitated Spanish pioneer in cubism. He worked well with any medium on virtually any surface.**

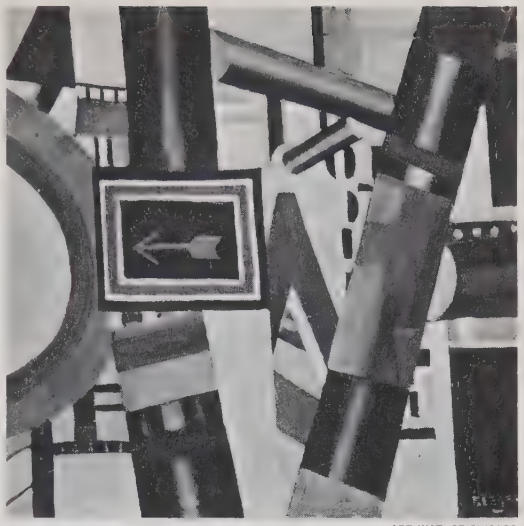
The contribution of Braque, cofounder (with Picasso) of cubism, was (in the first phase) the severity of form with which he attempted to subdue the color and formlessness of painting after impressionism. Meanwhile Picasso worked on the problem of design, which he fitted into a two-dimensional painting,

ruling out all the illusion-creating techniques used by painters since the Renaissance. The problem of painting in this epoch was to represent color *volume* on a *plane* surface, and the history of cubism was to be the history of a series of solutions to this problem. In reaction to impressionism and its visual spontaneity Braque and Picasso rejected all chance elements, everything atmospheric. Basing themselves upon the geometric crystallization which they saw in Cézanne, they set out to define the permanent properties of objects and their stability in a closed space, without perspective or light. It was for this reason that the cubists limited themselves to but a few subjects—trees, glasses, bottles, and a little later, musical instruments. These objects were geometrically reducible but still identifiable by the spectator.

MUS. OF MODERN ART
***Jeannette V.* by Matisse**

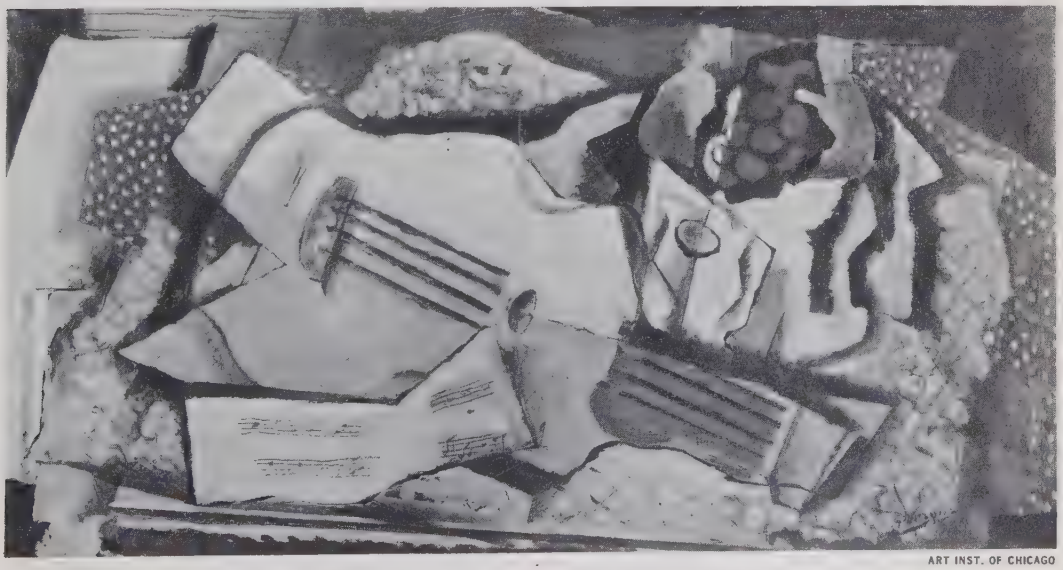
In the second phase of cubism, a growing decomposition of form took place. Braque rejected the landscape in favor of still life; that is, he went from visual space to tactile, manual space. During this period "simultaneism" entered cubism: various aspects of the same object were brought together on a single canvas; the object was opened up (in a "polyhedric fragmentation of volumes"). Painting was no longer to deal with what is *seen*, but rather with what is *thought*. Braque and Picasso attempted to avoid a closed, overly dry discipline by introducing the collage, which made use of natural elements in details of the composition; sand, glass, cloth, newspaper clips, and so on were inserted on the canvas as visual excitants.

By 1912 cubism began to proliferate. One of the most important of its submovements was called *Orphism* by its spokesman Apollinaire; its principal exponent was Robert Delaunay who, reacting against the subdued palette of the founders of cubism, proclaimed the *primacy* of color in pictorial composition. Another group was the *Section d'or* consisting of all those painters whose interest in cubism was technical and experimental, not doctrinal. Their only tenet was a common admiration for the geometry they saw in Cézanne. Apart from painters mentioned already, outstanding members of this group were the three brothers, Jacques Villon, Marchel Duchamp (whose *Nude Descending the Stairs* introduced cubism directly to America), and Duchamp-Villon.



ART INST. OF CHICAGO
Fernand Léger's *Follow the Arrow*, an oil on canvas. Drawn almost wholly from his own experiences, his works are largely delineations of an industrialized civilization.

The synthetic phase of cubism began in 1913 when Gris and Léger joined in it actively. Gris expressed the newest departure when he proclaimed: "From a cylinder I make a bottle." This phase included a complete break with all naturalism, and the creation of what was termed a *lyric* reality to replace a *representational* reality. Many poets now joined the movement, there was less austerity of palette, and in this period cubism ceased to be a merely empirical technique and became a conceptual theory—virtually a new aesthetic. Although the war of 1914 put an end to the joint work of the cubist painters and dispersed them as individuals, the influence of cubism persisted. See Abstract Art; Modern Art. Anthony Kerrigan



ART INST. OF CHICAGO
***Still Life*, an Oil on Canvas by Georges Braque**

CUBIT, an ancient measure of length, determined by the distance between the elbow and the tip of the middle finger. Used among various peoples, the cubit was the ordinary Hebrew unit of measurement; its exact length, however, is indeterminate. Most approximations vary between 17 and 18 inches. The height of Goliath (see GOLIATH) in I Samuel 17:4 would be 8 feet 1 inch according to this approximation. The Roman cubit is estimated to be 21 feet.

CUB SCOUTS. See BOY SCOUTS.

CUCAMAS. See COCOMAS.

CUCHULAIN (most common of many spellings), the chief heroic figure in Irish legend; his exploits are comparable to those of Hercules and the heroes in Greek mythology. Cuchulain was supposedly named for his act of killing a huge watchdog (*Cu*) belonging to a smith (*Chulain*), and substituting himself as guardian of the latter's house—hence Cuchulain, or Chulain's hound. Legend credits Cuchulain with the singlehanded defense of Ulster against the hordes of Medb, queen of Connaught, only one of his miraculous feats. He was slain in his twenty-seventh year by Lugaid in revenge for the slaying of the latter's father, Cúroi Mac-Daire.

CUCKOO, a widely distributed family of birds consisting of about 130 species. Cuckoos, family *Cuculidae*, are shy, being heard more often than seen. They range in size from about 5 inches in length to well over a foot. The bill is as long as the head, slender, and slightly downcurved. The wings of the cuckoo are long and pointed, the tail long and rounded. Some cuckoos are brilliantly colored, but most are brownish with whitish, barred under parts. The tail is spotted with white above, and the root of the bill and the feet are yellow. The young birds of most species are blackish, mottled with yellow and gray.

Yellow-billed Cuckoo

Many species of cuckoos are noted for their habit of exploiting other birds. The female of these species lays one of its eggs in the nest of another bird, where it is hatched by the foster mother. The young cuckoo then ejects the rightful nestlings and appropriates the entire attention of the foster parents, deserting them as soon as it is able to fly.

The common European cuckoo, *Cucutus canorus*, spends the summer in the northern parts of Europe and Asia, migrating in winter to Africa and India. Its familiar cry has been imitated in European clocks. Only one New World cuckoo is parasitic. The two cuckoos of the United States and Canada, the black-billed cuckoo, *Coccyzus erythrophthalmus*, and the yellow-billed cuckoo, *C. americanus*, are not parasitic. They build their own crude nests, which are little more than platforms of leaves, twigs, and bark, and rear their own young. Both species are about a foot in length, slightly shorter than the European cuckoo. They differ principally in the color of the beak, and in the tail feathers, which have prominent white tips in the yellow-billed species. Both of these cuckoos winter in South America.

CUCKOO WASP, a small beautiful insect belonging to the family *Chrysididae*. About a half-inch in length, cuckoo wasps are brilliant metallic green or blue, with the abdomen often tipped with red. These insects deposit their eggs in the nests of solitary bees or wasps in the absence of the owners. The eggs are walled in by the eggs of the bees, and the newly hatched larvae either destroy the rightful owners or starve them out by devouring their food.

CUCUMBER, a trailing or climbing annual belonging to the gourd family, *Cucurbitaceae* (see CUCURBITACEAE). Cucumbers, *Cucumis sativus*, have been cultivated for their edible fruit for more than 4000 years. In the United States the cucumber is an important vegetable crop, generally planted from seed. The plant's tendril-bearing vines have rounded or lobed alternate leaves and elongated, often spiny, fruit known as cucumbers. Since 96 per cent of the fruit is water, it has little food value, but its characteristic flavor made it a popular fresh vegetable commodity. Small well-formed cucumbers are placed in seasoned brine to make a variety of sour-tasting pickles. A sweet seasoned syrup is used in processing sweet pickles. See PICKLE.

Planting and Harvesting. Because the cucumber plant grows best in warm weather, the seeds should be sown after the danger of frost has past, and the crop should be harvested before the advent of frost. In the home garden, the seeds are usually planted in small hills spaced about 3 inches apart, with about 5 feet between rows to permit the plants freedom to grow. In commercial planting the seeds are placed 10 to 12 inches apart in rows 6 feet apart. From 2 to 3 pounds of seed per acre are usually required. The fruit matures rapidly in hot weather and should be picked frequently to prolong the bearing life of the plant. The most desirable cucumber has a diameter of slightly more than two inches and is at least 6 inches long. The pickle graded U.S. No. 1 does not exceed 3.5 inches in length. Although the yield per acre varies widely, about 300 bushels per acre is considered good.

Insect Pests and Diseases. The most serious insect pests of the cucumber are the striped and spotted cucumber beetles, *Diabrotica vittatta* and *D. duodecimpunctata* (see INSECT). Adult beetles attack seedling cucumbers, leaves, and shoots, while the beetle larvae feed on the roots of the plants. Both are further destructive in that they carry wilt-causing bacteria. Other important cucumber pests are melon aphids, *Aphis gossypi* (see APHID), which accumulate in large numbers on the lower surface of the leaf; and maggots, which attack the sprouting seeds if the soil is rich in manure or humus. The maggots may be effectively combated by mixing chlordan dust around each hill during planting. Cucumber beetles and aphids can be controlled by dusting or spraying with mixtures containing rotenone or cryolite. The dust or spray should be applied to plants as soon as the presence of insects is noted. The insecticide should cover the entire plant. Mosaic, a virus disease of the cucumber, causes warty fruit and wrinkled leaves. Important control methods include crop rotation and isolation from such plants as petunia, gladiolus, hollyhock, and soybean. Cucumbers should not be planted next to old alfalfa fields. Cucumber seeds are often treated with corrosive sublimate and dusted lightly with an appropriate chemical just before planting. See GARDENING; PICKLE; VEGETABLE.

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CUCURBITACEAE, the gourd or cucumber family with about 100 genera and nearly 800 species. In variety the plants are most abundant in the tropics, but through cultivation cucumbers, melons, squash, and pumpkins also thrive in northern climates. (See CUCUMBER; MELON; PUMPKIN; SQUASH.) The mock apple or wild balsam apple, found east of the Mississippi river, is also a member of this family.

The fruit of this family occurs in various sizes and shapes, each fruit generally containing a large number of seeds set in a spongy or juicy center, and covered with a thick or hard rind. One of the fruits, the watermelon, is the largest in the vegetable kingdom. In many species the trumpet-shaped flower is unisexual. Most of the *Cucurbitaceae* are annual plants which grow rapidly from seeds. Their tendril-bearing vines have alternate rounded or lobed leaves.

The fruit of various gourd species is sometimes cultivated for use as ornaments or curiosities (see GOURD). In some tropical countries the fruit of the calabash gourd, *Lagenaria siceraria*, is used for making such household utensils as serving cups and bowls. The African calabash pipe used for smoking is made from the neck of these gourds.

CÚCUTA, city, N Colombia, capital of the department of Norte de Santander, on the E slopes of the Cordillera Oriental, 250 miles NNE of Bogotá. Cúcuta is a communications, market, and processing center for an agricultural region particularly noted for coffee growing. Leading industries are coffee processing and the manufacture of textiles and food products. Cúcuta has considerable trade with the neighboring portion of Venezuela. There are an airport and a customhouse in the city. Cúcuta was founded in 1734. Many fine colonial buildings remain although much damage was done to the city by an earthquake in 1875. Pop. (1951) 70,375.

CUDAHY, city, SE Wisconsin, in Milwaukee County, on the western shore of Lake Michigan, on the North Western Railroad; 6 miles S of Milwaukee. The principal industries in Cudahy are meat packing, foundries, and the manufacture of machinery and chemicals. It was founded in 1893 when Patrick Cudahy moved his meat packing plant from Milwaukee to a site beside Lake Michigan. Pop. (1950) 12,182.

CUDBEAR. See ARCHIL; DYEING, *Vegetable and Animal Dyes.*

CUDDALORE or **KUDALUR,** city, SE India, in the state of Madras, capital of the district of South Arcot, on the Coromandel Coast of the Bay of Bengal, 100 miles SSW of Madras. Cuddalore is a seaport and commercial center. Leading exports are peanuts, cashew nuts, and textiles. Industries include the manufacture of textiles, salt, and construction materials. Nearby is the ruined fortress of Fort St. David, built by the British at the end of the seventeenth century. Cuddalore was held mainly by the British during the eighteenth century but with periods of French and Indian control. It finally passed into British possession in 1785. Pop. (1951) 69,084.

CUDWEED, any one of several plants of the genus *Gnaphalium*, and several related species, family *Compositae*. *Gnaphalium* are widely distributed herbaceous plants with alternate leaves and small yellowish white or brownish flowers. *G. decurrens* of North America is an annual or biennial that grows to a height of 3 feet. The low annual *G. palustre* is found from British Columbia to New Mexico. Related cudweeds include *Helichrysum faetidum; H. petiolatum*, often cultivated by gardeners; and *Leontopodium alpinum.*

CUDWORTH, RALPH, 1617–88, English philosopher and divine, was born in Aller, Somersetshire, and was educated at Cambridge University, where he later taught and became recognized as the leader of a group of theologians and philosophers known as the Cambridge Platonists. Cudworth's major work was *The True Intellectual System of the Universe: the first part, wherein all the reason and philosophy of atheism is confuted and its impossibility demonstrated* (1678). An elaborate, erudite attack on atheism, the work was an attempt to present *all* cases for atheism fairly and then to refute them; the resultant thesis often becomes unwieldy and sometimes incomprehensibly mystical in its arguments. The poet Dryden remarked of it that Cudworth had presented so many excellent arguments *for* atheism that his refutations hardly seemed adequate. The *Intellectual System* and a later work, *Treatise Concerning Eternal and Immutable Morality* (1731), are probably more interesting historically (as a key to post-Restoration seventeenth century religious thought in England) than they are as philosophical works. Cudworth's theory of a "plastic nature" (somewhat reminiscent of Plato's "world soul"), an attempt to explain the laws of nature without ascribing them directly to the handiwork of God, has been said by some psychologists to embody in germinal form the theory of the unconscious.

CUÉLLAR, town, central Spain, Old Castile, in the province of Segovia, 75 miles NNW of Madrid. Cuéllar is a market and processing center serving an agricultural region. Industries include the manufacture of food products, lumber, leather, and construction materials. Cuéllar was traditionally founded by the Romans and contains numerous notable ancient buildings. Pop. 7514.

CUENCA, city, S central Ecuador, capital of the province of Azuay, 190 miles S of Quito. Cuenca is an industrial and market center located in a valley of the Andes Mountains at an elevation above 8000 feet. It is the third largest city of Ecuador. Leading industries are the manufacture of Panama hats, textiles, leather, jewelry, and food products. Local agricultural produce is marketed in the city, including grains, sugar cane, fruits, coffee, and livestock. The city has a university and a noted cathedral. Cuenca was founded in 1557 and has many colonial period buildings. Pop. (1950) 39,983.

CUENCA, province, E central Spain, New Castile, bounded by the provinces of Guadalajara on the N, Teruel on the NE, Valencia on the SE, Albacete on the S, Ciudad Real on the SW, Toledo on the W, and Madrid on the NW; area 6588 sq. mi.; pop. (1950) 344,033. Cuenca, one of the poorest and least developed Spanish provinces, consists largely of mountainous terrain and forms a portion of the Meseta or central plateau of Spain. The province is cut by numerous valleys, principally those of the Júcar and Tagus rivers. The climate tends to extremes, with cold winters in the highlands and hot summers in the lowlands. Precipitation is light and droughts common. Agriculture is the main occupation, with grains, potatoes, fruits, and vegetables the principal crops. Sheep and goats are the most important livestock. Lumbering in the mountains is important. Salt and gypsum are the main mineral products. Cuenca is the capital.

CUENCA, city, E central Spain, New Castile, capital of the province of Cuenca, 85 miles ESE of Madrid. Cuenca is an industrial and market center located at an elevation of about 3000 feet near the Júcar River on the Madrid-Valencia railroad. Industries include the manufacture of leather, paper, lumber, textiles, clothing, and food products. Features of interest are an ancient fortress, a thirteenth century Gothic cathedral, and numerous old buildings. The city is of ancient origin and, during the Moorish period, was a fortified center. It was captured from the Moors in 1177, later becoming an important textile manufacturing and intellectual center in the late Middle Ages. During the Peninsular War Cuenca was partly destroyed by the Napoleonic armies. Pop. (1950) 24,836.

CUERA. See CHUR.

CUERNAVACA, city, central Mexico, capital of the state of Morelos, 37 miles S of Mexico City. The city, situated in a high mountain valley, is a noted health resort. The chief industries are sugar refineries; the manufacture of cement, cigars, and paper; and the processing of rice, fruit, and vegetables. Places of interest are the Cortés Palace, containing murals of the Spanish conquest and Mexican Revolution by Diego Rivera; a cathedral built in 1529; the eighteenth century Chapel of the Third Order; the Borda Gardens, the summer home of Emperor Maximilian and Carlotta (see MAXIMILIAN); and the church of Our Lady of Guadalupe. The area was occupied by the ancient Tlahuicas, people of Nahua origin, who built pyramids and dwellings. They became subject to the Aztecs; in 1521 they were conquered by Hernán Cortés (see CORTÉS, HERNÁN). Pop. (1950) 30,597.

CUERO, city, SE Texas county seat of De Witt County, on the Guadalupe River, the Southern Pacific Railroad, and U.S. highways 77A, 87, and 183; 79 miles ESE of San Antonio. Cuero is a market for

the surrounding poultry, cotton, and livestock farming area, and processes cotton and cottonseed and dairy and leather products. Pop. (1950) 7498.

CUESTA, a ridgelike land form resulting from the erosion of alternately resistant and nonresistant layers. This physiographic feature is generally found on the perimeter of a mountain range or on an emerging coastal plain. The ridge has a steep inland slope, or escarpment, and a broad, gentle slope toward the sea, known as the dip slope. The resistant layer of rock underlies the gentle slope and is exposed along the ridge. Under this layer is a less resistant material exposed by erosion and usually drained by a stream flowing parallel to the ridge on its inland side. Some cuestas are called hogbacks. The ridges along the gulf coastal plain in the southeastern United States are cuestas.

CUEVA DE LA GAROZA, JUAN DE LA, 1550?–?1607, Spanish poet and dramatist, was born in Seville. Little is known of his background and early life except that he was probably of noble birth, that he journeyed to Mexico with his brother (a chief officer of the Inquisition), and that after extensive travels and some years spent in Seville he settled in Portugal. De la Cueva's poetry, although it utilized a wide variety of forms, was not of particularly high quality; it is as a dramatist that he is remembered. One of the most popular playwrights of his day, he made a conscious attempt to develop a Spanish "national drama," using contemporary, historical, and legendary national themes and employing new meters and popular poetic forms. His writing greatly influenced such later dramatists as Guillén de Castro y Bellvís and Lope de Vega. De la Cueva's best-known play is probably *El infamador* (1581), in which he introduced the Don Juan type. His literary theories are set forth in *Ejemplar poético ó arte poética española* (1605) and in *Obras* (1582), a collection of poems.

CUFRA, See KUFRA OASES.

CUI, CÉSAR ANTONOVICH, 1835–1918, Russian composer, was born in Vilna, Poland, where his father, a French officer, settled after Napoleon's retreat from Moscow. Cui studied and taught military engineering, becoming something of an authority on military fortifications. Although he had little formal musical education, his prime interest was musical composition. When he met Mili Balakirev and heard his ideas about developing Russian national music, Cui became part of the group known as "the Five" and produced several operas and orchestral compositions which achieved fair success during his time. But his short compositions (songs, instrumental solos, and duets) showed his natural gift for melody to best advantage; these continued to be popular after such works as the operas *Angelo* (1876) and *Mam'zelle Fifi* (1903) fell into public disfavor. Cui was also known as a critic, and contributed to the leading journals of the day some brilliantly satirical articles on the state of Russian music.

CUIABÁ or **CUYABÁ,** city, W central Brazil, capital of the state of Mato Grosso, at the head of navigation on the Cuiabá River, in the Planalto de Mato Grosso, 820 miles NW of São Paulo. Cuiabá is a river and rail center for the shipment of cattle, hides, meat, sugar, alcohol, and ipecac. Gold and diamonds are mined nearby. The city was founded at the beginning of the eighteenth century and has a Portuguese colonial style government palace and a cathedral. Pop. (1950) 24,119.

CUIABÁ RIVER, W central Brazil, in the state of Mato Grosso, rises in the Serra Azul, 110 miles NE of the city of Cuiabá, flows in a SSW direction for about 300 miles, and joins the Paraguay River near the Bolivian border about 75 miles N of Corumbá. It is navigable from Cuiabá to its mouth.

CUIRASS, a piece of armor, or breastplate, named for the French *cuir,* leather. Designed to cover the front of the wearer, such protective coverings of leather were used in ancient times, but the cuirass was especially the piece or pieces of plate armor developed and worn in the late Middle Ages and early modern times. Regiments of horsemen wearing such body armor and known as *cuirassiers* were notable organizations in European armies in the seventeenth and eighteenth centuries.

CULBERTSON, ELY, 1891–1955, U.S. author and contract bridge authority, was born in Rumania; his father was a U.S. mining engineer who had made a fortune in Rumanian oil, his mother a Russian citizen. The family lived in Russia, but after the 1917 revolution Ely left the country and ultimately settled in New York. He had earlier become interested in the game of bridge and had made a detailed study of it. His wife, Josephine Murphy Dillon, was also a bridge expert; the pair formed a highly successful bridge team, challenging expert players and holding exhibition matches. Although Culbertson is remembered chiefly as a bridge expert, he was much interested in international politics and was the founder of a world federation movement. Among his books are *Red Russia Against the World* (1932), *Total Peace* (1943), *Must We Fight Russia* (1946), and numerous volumes on bridge and other games.

CULDEES, a monastic movement which appeared in Ireland in the eighth century. In its original form *culdees* referred to companions or vassals of God. Ireland had been a great center of Christian missionary activity in the sixth and seventh centuries, but then came a period of spiritual decline. The Culdees represented a reform movement. Beginning as hermits they gradually came together into communities, each under its own abbot, but as a group they never attained the status of a religious order under a definite rule and with a recognized head. The movement spread to Scotland, where it became stronger than in Ireland. There was a Culdee establishment at York, England, and at least one in Wales. In the twelfth century the Culdees came under canonical rule and lost most of their distinctiveness. See MONASTICISM.

CULEBRA. See PUERTO RICO.

CULEBRA CUT. See PANAMA CANAL.

CULEMBORG or **KUILENBURG,** town, central Netherlands, in the province of Gelderland, on the Lek River; 10 miles SE of Utrecht. Chief manufactures include furniture, textiles, and wood and metal products. In the town is a seventeenth century gate and a sixteenth century town hall. Pop. (1950) 11,037.

CULEX. See MOSQUITO.

CULIÁCAN, city, NW Mexico, capital of the state of Sinaloa, on the Culiacán River; 35 miles from the Gulf of California, 180 miles NW of Durango. Culiacán is a railroad center and is connected by railroad with its port of Altata. The chief industry of the city is the shipping of tomatoes, cotton, corn, tobacco, sugar cane, and fruit. There are leather and textile manufactures. Gold and silver are mined nearby. The city, founded by Nuño de Guzmán in 1531, was important in Spanish colonial history. The cathedral and parks and plazas are noteworthy. The University of Sinaloa is here. Pop. (1950) 48,963.

CULION ISLAND, central Philippines, in the province of Palawan, one of the Calamian Islands, lying between Mindoro on the NE and Palawan on the SW; area 153 sq. mi.; pop. 3279. Culion Island consists of plains and hills which rise to about 1500 feet in elevation. Rice, fruits, coconuts, and vegetables are the principal crops. Since 1906 Culion Island has been the site of a government-operated leper colony.

CULLEN, COUNTEE, 1903–46, U.S. Negro poet, was born in New York City and received his M.A. degree from Harvard University. His works, mainly concerned with Negro themes, include *Caroling Dusk* (anthology of Negro poetry, 1927), *The Ballad of the Brown Girl* (1928), *The Medea* (1935), *My Lives and How I Lost Them* (1942), and *On These I Stand* (published posthumously in 1947).

CULLEN, burgh, NE Scotland, in Banffshire, on Cullen Bay of Moray Firth, 10 miles W of Banff. Cullen is a seaside resort and has a fishing industry. In the city are Cullen House, noted for its garden, and a church founded by Robert the Bruce. Pop. (1951) 1555.

CULLINAN, town, NE Union of South Africa, in the province of Transvaal, 22 miles ENE of Pretoria. Cullinan, an important diamond mining center since 1902, contains the Premier Mine, one of the largest diamond mines in the world. In 1905 it yielded the famous Cullinan Diamond, the world's largest diamond. Pop. about 1500.

CULLINAN DIAMOND. See DIAMOND.

CULLMAN, city, N central Alabama, county seat of Cullman County, on the Louisville and Nashville Railroad and U.S. highways 31 and 278; 45 miles N of Birmingham. Cullman produces truck garden crops, corn, cotton, livestock, and poultry. Nearby is St. Bernard College for men. The city was founded in 1873 by German immigrants led by John Cullman, for whom the city and county are named. Pop. (1956 special census) 8437.

CULLODEN, battlefield, Scotland, 6 miles NE of Inverness. Here on April 16, 1746, Prince Charles Edward with about 5000 men was defeated by the Duke of Cumberland with about 9000. Culloden marked the end of the uprising to restore the Stuart kings to the throne of Great Britain, though Charles Edward himself escaped. The battle is commemorated by a cairn 20 feet high, erected in 1881. See SCOTLAND, *The Eighteenth Century;* STUART, CHARLES EDWARD LOUIS PHILIP CASIMIR.

CULMINATION, the date on which any given hour line becomes meridian (see MERIDIAN, CELESTIAL). A star attains its maximum altitude (see ALTITUDE) when it is on the celestial meridian. It is then said to be at upper culmination or upper meridian transit or upper transit. When a star reaches its greatest angular distance below the horizon it is at lower culmination. A circumpolar star is visible at both upper and lower transits, at its maximum and its minimum elevation, whereas stars that are farther from the celestial poles are not visible at lower culmination. See CIRCUMPOLAR STAR.

CULPEPER or **COLEPEPER, THOMAS,** 2nd **BARON,** 1635–89, English colonial administrator in America. In 1673 he received, with Lord Arlington, a grant of all Virginia from King Charles II. Commissioned governor in 1675, he administered the colony's affairs through deputies until 1680, when the king sent him to Virginia. He became popular because of his pardon of participants in "Bacon's Rebellion," but soon went back to England. On his return to Virginia, 1682, his administration became corrupt and cruel. He returned to England the following year and was dismissed as governor. See BACON'S REBELLION.

CULPEPER, town, E Virginia, county seat of Culpeper County, on the Chesapeake and Ohio and the Southern railroads and U.S. highways 15, 29, and 552; 600 miles SW of Washington, D.C. The Culpeper Minutemen were organized here in 1775. During the Civil War several battles were fought nearby. (See BRANDY STATION, BATTLE OF; MINUTEMEN.) Pop. (1950) 2527.

CULROSS, burgh, SE Scotland, in Fifeshire, on the Firth of Forth, 13 miles ESE of Sterling. Culross is a resort town notable for the seventeenth and eighteenth century buildings of Culross Abbey, founded by Malcolm Earl of Fife in 1217, and Dunimarle Castle. Pop. about 600.

CULTIVATION. See AGRICULTURE.

CULTURAL LAG. See CULTURE.

CULTURE is an organized group of learned responses of a particular society, or the total round of human activities, not due to heredity, shared by members of a group. Culture is socially transmitted. Cultural behavior is learned behavior which each person acquires as a member of an organized group of individuals, or a society, and each personality is the product of its own unique cultural history. Culture, to the social scientist, includes all of civilization's social and material inventions and institutions, as distinguished from the popular use of the term to signify the artistic and literary achievements of a people, such as Greco-Roman culture. Culture is a part of the total life experience of every individual. It determines and gratifies the care he receives as an infant, the training he will undergo as a child, the pattern of his marriage and family life, and the manner in which he will be buried.

Culture Growth. Archaeologists, who deal with objects made and used by prehistoric peoples, seldom can determine the laws, religious beliefs, or social organizations with which these entities were associated, but they find recognizable similarities between groups in the structure of houses, arrangement of villages, methods of making and ornamenting pottery and weapons, and tools and other devices used in food gathering or food production. Those structures and devices which are alike are classed together as a "culture," or pattern or assemblage of characteristics of material culture which tend to be repeated at site after site. Thus it is possible to identify, for example, a Maya culture as contrasted with an Aztec culture.

Acculturation and Diffusion. Once a culture is recognized, it becomes evident that it has grown or developed from earlier or simpler beginnings. The stage is then set for an inquiry into cultural origins and the dynamics of cultural growth. Some observers contend that such growth or development is in response to the needs of man in society, and point to the many similarities in responses as indicative of an essential identity of the human mind. Some scholars hold that geographic factors are the determinants of cultures, while others consider cultural growth as due primarily to the accumulation of ideas within a group resulting in part from self-growth but in greater part from interchange of ideas with other peoples. Such interchange is labeled diffusion: if the new ideas are integrated with the established pattern the result is acculturation. If the contacts are too many or too disturbing to traditional beliefs, cultural disintegration may result—a condition often observed when a primitive society meets with a complex or highly developed civilization, as in the case of the tribal cultures of the American Indian and of the South Sea islanders. Some cultures are more conservative or more resistant to change than others, and part of a culture may change rapidly while another part is little affected. This tendency is generally known as a cultural lag.

The great differences in technical achievement of various peoples have led to the claim that "high" and "low" cultures are caused by differences in racial ability, and thus justify the claim that some peoples are innately superior to others. Such claims have been disproved by archaeologists and historians who have shown conclusively that peoples once far advanced have sunk into oblivion. At the time Egypt led in civilization, Greece and Rome possessed simple cultures. In classical times the latter were dominant, and the peoples of central and northern Europe were living under primitive conditions. The time came, however, when these very backward peoples became world leaders.

Patterning of Cultures. Anthropologists who have plotted the cultures of the North American Indians on the map have found much regional specialization. The Eskimos who live along the Arctic seas have many elements of culture in common which they do not share with other American groups. For example, they build snow houses, use sleds and dog teams, wear tailored garments, make skin boats, and hunt with the spear thrower and harpoon. Religious and social organization is weak, but there is a well developed and characteristic mythology and art.

On the northwest coast of America are several tribes having no political ties with each other but possessing many culture elements in common, including plank houses, totem poles, and boxes, all elaborately decorated with a distinctive art. Social organization—with chieftainship, rank, and wealth distinctions—is highly developed, while religious ideas and secret societies dominate the activities of the people, all of whom depend to a great extent on the salmon run for their food supply.

In a similar manner, it can be shown that the many tribes and linguistic groupings in California relied on the wild acorn crop for their livelihood and possessed similar cultures.

Culture Areas. The cultural groupings discussed are known as *culture areas*. When it is recognized that culture does have a geographical setting it is possible to study it objectively. Archaeology permits the study of its growth through time and the determination of what any one culture owes to contacts with other peoples. It shows what is accepted and what is rejected when two known cultures meet. It gives evidence of the fertilizing effects of contacts and of the inhibiting results of isolation. Nine such culture areas are recognized in America north of Mexico. Some of these appear to be directly related to food supply, others have developed in spite of adverse environmental conditions. The early Indian settlers in the semiarid Southwest were hunters and food-gatherers, but when the knowledge of corn, beans, and squash came to them through contact with Mexico, they borrowed these food plants and other culture elements and on that foundation built the Pueblo Indian culture pattern. See INDIAN, AMERICAN.

It thus appears that the prior history of a group, or perhaps mere accident, often led a tribe to develop certain possibilities offered by its environment. Once adjusted to this life the tribe continued to develop it, perhaps with additions resulting from trade and other contacts. Other tribes coming into the area tended to borrow the adjustment already made, and thus a culture area came into existence. This concept of "patterning of culture" is useful in the study both of the development of social institutions and of material culture. See ANTHROPOLOGY; ETHNOLOGY.

FAY-COOPER COLE

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CULVER CITY, city, S California, in Los Angeles County, a W residential suburb of Los Angeles, lying S of Beverly Hills. Culver City is a motion picture center and manufactures aircraft and aircraft parts. Pop. (1956 special census) 31,367.

CULVERIN, a gun used especially on ships in the seventeenth and early eighteenth centuries, usually a long, heavy cannon firing an 18-pound shot. There were smaller forms, often called medium, bastard, or demi-culverins. Derived from the French *coulevrine*, serpent-like, the culverin was first known as a kind of hand gun.

CULVER-STOCKTON COLLEGE. See COLLEGES AND UNIVERSITIES.

CULVERT, a transverse drain, usually installed under a roadway to carry off water that otherwise would collect at a low point. Pipe culverts are made of cast iron, reinforced concrete, or sheet metal (usually corrugated galvanized steel or iron). Pipe culverts generally range from 12 inches to about 6 feet in diameter. Box culverts, slab-top culverts, and arch culverts are made of reinforced concrete cast in place. They may have spans up to 20 feet; anything larger is usually classed as a bridge.

CUMAE, ancient city, S Italy, near the Mediterranean coast, W of Naples. Cumae was one of the earliest Greek colonies, traditionally said to have been founded about 1050 B.C., but actually about 750. A wealthy and powerful city-state in the seventh and sixth centuries, it engaged in a long struggle with the Etruscans, who were decisively beaten off Cumae in a naval battle, 474 B.C., by Hiero I of Syracuse, an ally of the city. Later in the fifth century B.C. Cumae fell to the Samnites, and about 338 B.C. to the Romans, who conferred citizenship on the inhabitants. Cumae was a principal center from which the alphabet and Greek culture and religion spread to the Etruscans and the Romans. Its greatest fame derived from the Cumaean Sibyl, or prophetess, from whom, according to legend, the Romans acquired the Sibylline books (see SIBYL). Cumae fell into decay in later Roman times, was burned by the Saracens in the ninth century, and destroyed by the Neapolitans early in the thirteenth.

CUMAN, a Turkish people who moved into Europe in the early eleventh century, first along the lower Volga, then westward to the Dnepr and later to the Danube. They remained largely hunters and warriors, raiding Kievan Russia, Hungary, and the Byzantine Empire. Cumans were allies of the Bulgarians in the early thirteenth century. The Mongols destroyed their power in 1238. Of those who were captured and enslaved, one group founded a line of Mameluke rulers in Egypt. (See MAMELUKE.) Other Cumans spread into Bulgaria and Hungary and were ultimately absorbed in the populations there.

CUMANÁ, city, NE Venezuela, capital of the state of Sucre, near the Gulf of Cariaco, about 190 miles E of Caracas. Cumaná is an industrial and market center located in an agricultural region producing fruits, coffee, coconuts, cacao, sugar cane, beans, and livestock. Agricultural produce, vegetable oil, rum, and hides are exported through its port, Puerto Sucre, a mile to the north. Industries deal with textiles and the processing of agricultural produce. The city was founded in 1521 as Nueva Toledo and is the oldest continuously occupied European settlement of South America. Antonio José de Sucre, the revolutionary leader and first president of Bolivia, was born at Cumaná. Numerous earthquakes have damaged the city at various times. Pop. (1950) 54,351.

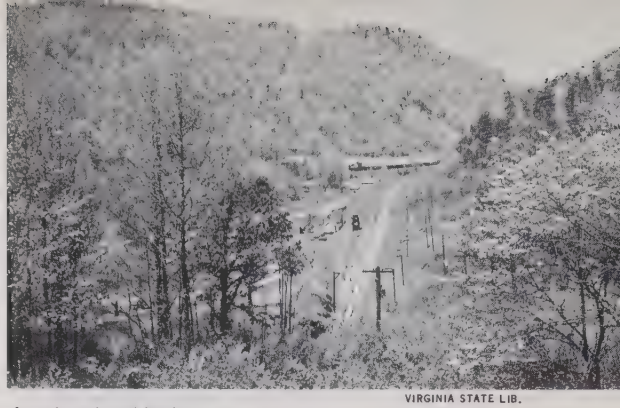
CUMBERLAND, RICHARD, 1732–1811, English author, was born in Cambridge. He was graduated from Trinity College, Cambridge, was befriended by Lord Halifax, and ultimately became his secretary in the Board of Trade. Cumberland wrote a large number of plays, including *The Brothers* (1769) and *The West Indian* (1771); three novels; two volumes of poems; and, probably his most interesting book, *Memoirs* (1806–07), in which are described many prominent figures of the day, including David Garrick and Oliver Goldsmith.

CUMBERLAND, city, SE Kentucky, in Harlan County, on the Louisville and Nashville Railroad and U.S. Highway 119; 48 miles ENE of Middlesboro. The city is in a coal mining region. Concrete blocks, popcorn, potato chips, peanut products, and lumber are processed. Pop. (1950) 4249.

CUMBERLAND, city, W Maryland, second largest city in the state, county seat of Allegany County; on the Potomac River; the Baltimore and Ohio, the Pennsylvania, and the Western Maryland railroads, and U.S. highways 40 and 220; a scheduled airline stop; 115 miles WNW of Baltimore. This area in the Allegheny Mountains was settled about 1730. It was surveyed in 1745 and the Ohio Company established a trading post here in 1750. Fort Cumberland was erected on the site of the present city in 1754 and named for the Duke of Cumberland, third son of George II. During the French and Indian War General Braddock left here on his ill-fated campaign in July 1755. Colonel George Washington was then put in command of the garrison. (See FRENCH AND

CUMBERLAND C. OF C.

Hemmed in by mountains, this Celanese plant is one of the major industrial units at Cumberland, Md. The city is also an important shipping point for coal and limestone.



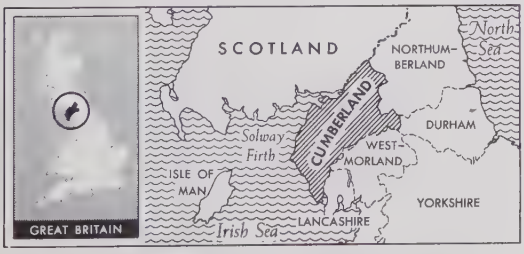
VIRGINIA STATE LIB.

A railroad and highway retrace the route of the Wilderness Trail through the Cumberland Gap in the Appalachians, the early gateway for Virginia pioneers moving into Kentucky.

INDIAN WAR.) The town of Cumberland was laid out in 1785 and first known as Washington Town. It became the starting point for the National (Cumberland) Road, authorized in 1806 and begun in 1811 (see NATIONAL ROAD). The commission form of government was adopted in 1815 when Cumberland was incorporated as a town. It was incorporated as a city in 1856. The western terminus of the Chesapeake and Ohio Canal was established here in 1850 (see CHESAPEAKE AND OHIO CANAL). Cumberland has been the chief shipping point for the rich bituminous coal and limestone mined in the region. Railroad shops, lumber mills, breweries, and a rubber tire plant are important industries. Celanese, rayon, tile, brick, dairy products, and iron and steel products are also processed in Cumberland. Repeated flooding of the business section has necessitated much rebuilding. Pop. (1950) 37,679.

CUMBERLAND, town, NE Rhode Island, in Providence County, between the Blackstone River and the Massachusetts line; on the New York, New Haven and Hartford Railroad; 12 miles NW of Providence. William Blackstone, one of the first white settlers in the area, made his home at Study Hill in 1635. The area was part of Massachusetts until it was annexed in 1747 by royal decree. In 1867 part of Cumberland was set off as the town of Woonsocket. The seat of town government was at Cumberland Hill until 1868, when it was moved to Valley Falls. Pop. (1950) 12,842.

CUMBERLAND, county, NW England, bounded by the Solway Firth and Scotland on the N, Northumberland on the E, Durham on the SE, Westmoreland and Lancashire on the S, and the Irish Sea on the W; area 1520 sq. mi.; pop. (1951) 285,347. Cumberland is made up largely of mountainous country with lowlands in the northwestern and coastal districts. The southern part of the county includes much of the scenic Lake District of England and the Cumbrian Mountains. Scafell Pike (3210 ft.) and Skiddaw (3053 ft.) are the two highest peaks. The Eden is the principal river. Coal is mined in the western part of the county. Other minerals include iron ore, granite, and lead. Agriculture is generally the leading occupation with mixed farming on the lowlands and sheep raising in the mountainous areas. Major towns and industrial centers are Carlisle, the county seat; Keswick, Whitehaven, Workington, and Penrith. Antiquities in Cumberland include numerous pre-Christian relics, part of the Roman Hadrian's Wall, and a number of medieval castles. See LAKE DISTRICT OF ENGLAND; CARLISLE; HADRIAN'S WALL.



Location Map of Cumberland

CUMBERLAND GAP, a pass in the Cumberland Mountains of the southern Appalachians, near the junction of Kentucky, Virginia, and Tennessee; 50 miles NNE of Knoxville, Tenn. The gap is at 1650 feet above the sea and is flanked on its north by the Pinnacle, which rises 2500 feet. Cumberland Gap, whose formation is attributed to local erosion, was first charted in 1750 by Dr. Thomas Walker, an explorer in the Kentucky area for the Loyal Land Company. It became a principal path for settlers crossing the Appalachians after Daniel Boone blazed the Wilderness Trail for the Transylvania Company in 1775. More than 100,000 people went through the pass to settle in Kentucky before 1795. During the Civil War Cumberland Gap was a strategic point. The Confederates held it from June 1861 until they were deposed on June 17, 1862, by Gen. George W. Morgan and his troops, who were forced to evacuate three months later. Union forces under Gen. Ambrose E. Burnside captured a Confederate garrison of 4000 under the command of Gen. John W. Frazer here on Sept. 9, 1863. Many caves in the area, including Soldiers, or Cudjo's Cave, were used to store supplies during the war. In 1888 a group of English financiers bought 80,000 acres of land to the west of the gap and established the town of Middlesboro the following year with the idea of developing industry, a plan that failed when the backers experienced reverses five years later. Cumberland Gap National Historical Park was formally established Sept. 14, 1955, when the National Park Service accepted the deed to 20,100 acres of land from the states of Kentucky, Tennessee, and Virginia. The town of Cumberland Gap, located in the park on the Tennessee side, is on U.S. Highway 25E, which follows the old Wilderness Trail. See WILDERNESS TRAIL; BOONE, DANIEL; TRANSYLVANIA COMPANY; MIDDLESBORO.

CUMBERLAND ISLAND, largest of the Sea Islands, in the Atlantic Ocean off the SE coast of Georgia, between the mouths of the Satilla and the St. Marys rivers. The island was the site of two forts built by James Oglethorpe for the defense of southeastern Georgia.

CUMBERLAND MOUNTAINS AND PLATEAU, an area forming part of the Appalachian Mountain System. Cumberland Mountains sometimes describes the entire area. The mountains, however, are more specifically an area of faulted sandstone beginning at the western edge of Virginia and extending southwest about 165 miles through southeastern Kentucky and into Tennessee. At their broadest point the Cumberlands are about 30 miles

COMMONWEALTH OF KENTUCKY, DIV. OF PUBLICITY

The natural beauty of Cumberland Falls is an attraction in the southeastern Kentucky mountains, where the Cumberland River threads its way down the Cumberland Plateau.

wide. The highest point is Big Black Mountain, 4150 feet, in southeastern Kentucky. The plateau section extends some 375 miles from east central Kentucky southwest to north central Alabama. The plateau is about 50 miles wide with elevations varying from 1000 to 3500 feet. One of the prominent heights is Lookout Mountain, 2146 feet, near Chattanooga, Tenn. The plateau is an anticline of sandstone, shale, and conglomerate. The southern portion is more deeply eroded and more rugged. The Tennessee and Cumberland rivers drain the area. Coal, iron ore, and timber are the chief natural resources of the Cumberland Mountain area.

CUMBERLAND PENINSULA, Canada, in the Northwest Territories, SE Baffin Island, N of Cumberland Sound, extending about 200 miles into Davis Strait. The surface is mountainous, rising to 8500 feet in the Penny Highland. Pangnirtung trading post is on the southwest coast.

CUMBERLAND PRESBYTERIANS. See PRESBYTERIANISM.

CUMBERLAND RIVER, a tributary of the Ohio River, rises in Harlan County, Kentucky, flows W and enters Tennessee about 80 miles NE of Nashville, Tenn., follows the northern edge of the Nashville Basin, re-enters Kentucky about 32 miles WNW of Clarksville, Tenn., and flows north to join the Ohio River about 12 miles NE of Paducah, Ky. The Cumberland River follows a general westerly course of 690 miles and has a drainage basin of about 18,500 square miles. Below Nashville a system of locks permits the movement of river craft up to 6-foot draft. Smaller craft may navigate the river to Wolf Creek Dam, 361 miles above the mouth. The dam, 258 feet high and 5736 feet long, forms Lake Cumberland. Navigation and flood control are also aided by the Dale Hollow Reservoir on the Obey River near its confluence with the Cumberland River about 30 miles southeast of Wolf Creek Dam. Near Corbin the river makes an abrupt drop of 68 feet at Cumberland Falls.

CUMBERLAND ROAD. See NATIONAL ROAD.

CUMBRAES, THE, two islands, W Scotland, Buteshire, in the Firth of Clyde, lying to the SE of Bute Island; area 5 sq. mi.; pop. (1951) 2079. Great Cumbrae, about 4 miles long and 2 miles wide, contains the town of Millport, a vacation resort and fishing port. Little Cumbrae is only 2 miles long and 1 mile wide. Both islands rise only a few hundred feet in elevation. Mixed farming, fishing, and catering to tourists are the main occupations.

CUMBRIAN MOUNTAINS, NW England, in S Cumberland, NW Lancashire, and W Westmoreland. The Cumbrian Mountains extend for about 30 miles and form part of the Lake District of England. The area is noted for its picturesque scenery and includes Scafell Pike (3210 ft.), the highest peak in England. See LAKE DISTRICT OF ENGLAND.

CUMIN or **CUMMIN,** aromatic seeds that are used as a flavoring agent in soups, cheeses, anchovies, and pickles. Any one of several plants may yield these seeds. Most commonly used plants are *Cuminum odorum; Nigella sativa*, or black cumin; and *Pimpinella anisum*, sweet cumin or anise. See ANISE.

CUMMINGS, EDWARD ESTLIN, known as e e cummings, 1894– , U.S. poet, was born in Cambridge, Mass., the son of a Harvard professor. He was educated in Cambridge public schools and at Harvard. Joining the Norton Harjes Ambulance Division, 1917, he drove an ambulance for six months in France, where he was imprisoned briefly for a minor indiscretion. Later he was sent home and drafted into the U.S. Army. *The Enormous Room* (1922) reflects his prison experience and his disillusionment concerning war. His first book of verse was *Tulips and Chimneys* (1923), followed by *XLI Poems* (1925), *&* (1925), *Is 5* (1926). Cummings experimented with many forms: a play *him* was performed at Provincetown Playhouse in 1928; a visit to Russia in 1931 resulted in the book *eimi* (1933), done in both prose and poetry, which earned him a denunciation from Moscow; it was followed by *Tom* (1935), a ballet burlesquing *Uncle Tom's Cabin*. Cummings also gained some recognition as a painter, and one of his books *CIOPW* (1931), is a collection of his pictures in charcoal, ink, oil, pencil, and water colors. His first *Collected Poems* appeared in 1938, after which came *50 Poems* (1940), *IXI* (1944); *Santa Claus* (1946), an opera; and *Kyrie* (1950). *Six nonlectures* (1953) was the published collection of his Charles Eliot Norton lectures, delivered at Harvard in 1952–53.

The chief peculiarity of Cummings' poetry is his use of typography to indicate (ostensibly) the manner in which a poem should be read, but his deviations from the normal actually follow no set rule and are primarily an expression of his individualism and general philosophy of debunking. He is at once an ardent romantic and a cunning satirist ready to question all the truths of the world, while at the same time readily admitting that it is an amusing and interesting place in which to live.

CUMMINGS, HOMER STILLE, 1870–1956, U.S. cabinet officer, was born in Chicago, Ill., and was graduated from Yale University with a degree in law. As U.S. attorney general, 1933–39, under Pres. Franklin D. Roosevelt, Cummings sponsored many changes in the department of justice and federal judicial system—new rules of civil procedure, an administrative office for federal courts, and extended the authority of the Federal Bureau of Investigation. He enlarged the prison system and established Alcatraz as a federal penitentiary.

CUMMINGS, WILLIAM ARTHUR, known as Candy, 1848–1924, U.S. baseball player, member of Baseball Hall of Fame, was born in Ware, Mass. Credited with inventing the curve ball in 1867, he pitched for New York, Baltimore, Philadelphia, Hartford, and Cincinnati, 1872–77, winning 145 major league games. In 1877 he became president of the first minor league, the International Association.

CUMULUS. See CLOUD.

CUNAXA, ancient town, Babylonia, near the Euphrates River, N of Babylon. Cunaxa was the scene of the battle in 401 B.C. between Artaxerxes II and his brother Cyrus for control of the Persian Empire (see CYRUS THE YOUNGER). Cyrus and his Greek troops had gained the advantage when Cyrus was killed and the battle and the cause were lost. The expedition against Artaxerxes and the retreat of the Greek mercenaries after Cunaxa is the subject of Xenophon's *Anabasis*.

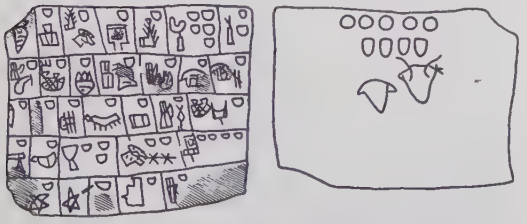
CUNDINAMARCA, department, central Colombia, bounded by the departments of Boyacá on the N and NE, Huila, Tolima, and Caldas on the W, and the intendancy of Meta on the SE; area 9108 sq. mi.; pop. (1952) 1,624,044. The department consists mostly of highlands forming part of the

Cordillera Oriental of the Andes Mountains. Peaks over 13,000 feet occur but much of the department is made up of high plateaus, particularly the Sabana de Bogotá. Rainy tropical conditions occur in the low valleys and a cool temperate type of climate with moderate precipitation characterizes the extensive plateaus. Agriculture is the principal occupation with cereals, potatoes, and fruits the leading highland crops. Sugar cane, bananas, yucca, cacao, and cotton are cultivated in the lowlands. Coffee is extensively grown on the mountain slopes from about 5000 to 7500 feet in elevation. Cattle are the most important livestock. Coal, salt, iron, gold, zinc, copper, and sulfur are the main mineral products. Cundinamarca is one of the most populous and important regions of Colombia. Major cities and industrial centers are Bogotá, the national and departmental capital; Girardot; and Facatativá. Before the Spanish conquest the area now known as Cundinamarca was the center of the Chibcha nation. See BOGOTÁ.

CUNEIFORM, the system of writing employed by the ancient Mesopotamian scribes to render the Sumerian and Akkadian (Assyro-Babylonian) languages (and also used by certain neighboring peoples who came under their influence), the languages written in this script, and the literatures composed in these languages. *Cuneiform* means, literally, wedge-shaped.

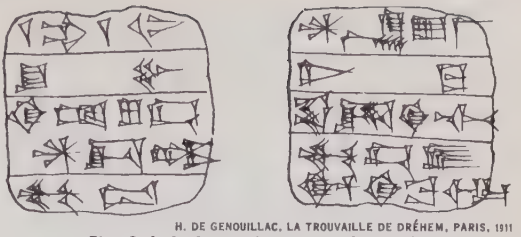
Prehistory of Cuneiform Writing. According to modern theories, writing was invented in southern Mesopotamia for the first and perhaps the only time. Its development can be traced best at the site of ancient Uruk, the biblical Erech, which has been excavated by archaeologists. At this site, the earliest "occupational levels"—those immediately above virgin soil—contain no inscribed materials at all: these first appear in the fourth level from the top of the archaic portion of the mound, called Uruk IV by the excavators. The earliest written records are simple tallies of animals, as in Fig. 1, which shows a clay tablet on which word signs and numbers have been scratched and pressed with a reed stylus. The front of the tablet contains thirty "cases" (lines), each giving a figure and a personal name; the back contains the total, 54, and the picture of an ox and a cow, and means "54 cattle." While the personal names cannot be deciphered, it is known that the cases are to be read from right to left and the columns from top to bottom; when the scribe had filled the front of the tablet, he turned it over like the page of a book and inscribed the back. The signs themselves are stylized (conventionally simplified) pictures. Evidently a herdsman had been entrusted with various numbers of cattle by 30 different men, and wished in this way to account to the owners when he returned at the end of the day. Similar economic motives inspired the other early tablets from Uruk, and therefore (presumably) the invention of writing in general. This cannot have occurred later than 3000 B.C., for by this time Egypt and Persia had developed their own systems of pictographic writing under Mesopotamian stimulus.

Origin of Cuneiform Writing. In Mesopotamia the most readily available writing materials were the omnipresent clay soil to write on, and marsh reeds to write with. When the cross-section of the reed was



I. J. GELB, A STUDY OF WRITING, UNIV. OF CHICAGO PRESS, 1952

Fig. 1. Left, front of tablet; right, back.



H. DE GENOUILLAC, LA TROUVAILLE DE DRÉHEM, PARIS, 1911

Fig. 2. Left, front of tablet; right, back.

triangular, its impression on the moist clay yielded the characteristic wedge-shaped lines which gave cuneiform its modern name. It was this form which was gradually adopted for the writing of economic documents, which continued to form the main impulse to writing. Such lines are not, however, suited to reproducing pictures; they are, for example, incapable of rendering curved lines. Therefore cuneiform signs later than approximately 2500 B.C. were no longer recognizable as pictures. The signs for "ox" and "cow," for example, which were already stylized as in Fig. 1, thereafter were written as in Fig. 2, which begins "one ox (and) one cow." Note that it had been found convenient to turn the tablet on its side, so that the cases were henceforth read from top to bottom (and the columns, if any, from right to left), while the tablet was turned upside down in order to inscribe the back. (At the same time that they were inventing the cuneiform signs, the Mesopotamians were also experimenting with a purely linear script for use on stone monuments. Here the sign for "ox" appeared as ⊏▷. Eventually, however, cuneiform signs were incised into stone, too, although for a long time in the direction of the old pictographic signs.)

Inner Development of Cuneiform. By obliterating its pictorial origin, Mesopotamian cuneiform (unlike Egyptian hieroglyphic writing) early sacrificed the ability to render fine distinctions graphically. The number of different signs was gradually reduced until it was stabilized at about 600. But the loss in the ability to render concrete objects was more than compensated for by an important inner development: phonetization—the use of word signs to represent other words, including abstracts, and even meaningless syllables having the same or similar pronunciations. This development probably resulted from the need to render the personal names of foreigners, for these could not be rendered by the simple word sign or two that the inventors of the script employed for their own names as shown, for instance, in Fig. 1. (Compare the predicament of an American Indian, accustomed to names like "Black Hawk" or "Sitting Bull," which he could easily render by pictures, having to write the name "Washington.") The inventors of phonetization (perhaps the foreigners themselves) were the Sumerians. The signs for "ox" and "cow" served not only for these words, but began to serve also for the syllables *gu*(*d*) and *ab* in any word which might contain these syllables, for these are the Sumerian pronunciations of these words. No more important contribution than this was made to the progress of writing until the invention of the alphabet. And for the rest of its history, Mesopotamian cuneiform underwent little more than external changes, affecting chiefly the forms which its signs took. Thus the latest form in which we meet the "ox" sign is ▷◁, for by 1000 B.C. all the signs were combinations of just three basic lines, ▷—, ▽, and ◁.

The Spread of Cuneiform Writing. An invention as useful as cuneiform writing was sure to spread far and quickly from its original home among the Sumerians of Mesopotamia. By some peoples, the Sumerian system was taken over in its entirety, so that both the underlying principle and the specific forms and values of the signs were copied without major changes. This was done first and foremost by the Akkadian

settlers of Mesopotamia, who were called Babylonians in the South and Assyrians in the North. Later on, the Hittites and other early inhabitants of Anatolia (present-day Turkey) adopted cuneiform for their languages. Other peoples were inspired by the Sumerian model to invent entirely new systems of cuneiform writing, with signs of different shape and significance from those of Sumerian. Such were the Ugaritans of Syria, the Elamites of Persia (where the older, and still undeciphered, picture writing was abandoned), and the Urarataeans of Armenia. By 1500 B.C. the use of some kind of cuneiform script was so familiar to large parts of the Near East that Akkadian became the language of correspondence among all its royal courts, and even the Egypt of this time has yielded an entire cuneiform archive, that of Tell el-Amarna, to the spade of the excavator.

Death and Recovery of Cuneiform. In the great cities of Assyria and Babylonia, such as Assur, Nineveh, Babylon, and Uruk, cuneiform flourished for a thousand years more as a measure of recording the transactions of private businessmen and the building and military exploits of great kings like Sennacherib and Nebuchadnezzar as well. It was also the vehicle of scholarship, and at Nineveh King Assurbanipal of Assyria filled an entire library with copies of the texts of all ages. Cuneiform scholarship, in fact, outlived both the Assyrian and the Babylonian empires by more than 500 years. For, although Aramaic became the language of administration after 500 B.C., Babylonian astronomers continued to record their observations in cuneiform as late as the first century A.D. Thereafter, however, the "script and language of the Chaldaeans" (as it is called in the *Bible*, Daniel 1:4) was quickly and utterly lost to mind. Medieval travelers to Mesopotamia made no mention of it, and when it was rediscovered during the seventeenth century in Persia, it was for some time not even recognized as a system of writing. The word "cuneiform" was first applied to it in 1700 in Latin, and in 1802 in English; by 1850, it had been successfully deciphered. But the recovery of cuneiform was a continuous perhaps never-to-be-completed process: after more than a century of Assyriology, and the decipherment and translation of tens of thousands of cuneiform texts, hundreds of thousands more remained unpublished in the museums of America, Europe, and the Near East, and even these represented only a fraction of these almost indestructible documents which the soil of Iraq and adjoining portions of Syria, Turkey, and Iran might be expected to yield.

Types of Cuneiform Literature. Although many in number, cuneiform texts can nearly all be classified under one of three categories, according to the motive which inspired them. If a text was of more or less passing significance, it was prepared in one or two clay-tablet copies and deposited in an archive, whether this was a huge royal archive or a more modest private one. We may call such texts *archival;* they form the largest category, for they include all contracts, letters, legal decisions, and accounts. If a text was intended to last for all time, it was inscribed on large clay cylinders or more often on stone or even precious metal, and set up, sometimes in many copies, either in the streets or public buildings where all might see it, or in the foundations of the buildings where future rebuilders would come upon it. Such *monumental* texts include the historical inscriptions of the kings, the votive inscriptions of private individuals, and the seals in the shape of cylinders which every person of consequence wore in order to sign documents (for only the trained scribes were able to write in most periods). Finally, if a text, even though written on a clay tablet, was recognized as having some transcending importance, it would be copied anew by successive generations of student scribes, until it became a part of the accepted tradition, or canon, of Mesopotamian literature. This *canonical* cuneiform literature surpassed in scope and extent, though not in depth, even the Old Testament, embracing in the end all the fields of ancient knowledge. We find included in it such diverse forms as: myths, epics, and history; psalms, prayers, incantations, and rituals; grammars, dictionaries, and lexicons; and many other genres, some religious, some practical, and some purely aesthetic in intent. Perhaps the most characteristic of these genres is the "omen literature." In it, long lists of natural phenomena of every kind, whether observed in the stars, in the entrails of slaughtered animals, or in the appearance of persons, places, or objects encountered on one's way, are all interpreted as good or bad omens for specific human activities. Altogether, the archives, monuments, and canons of the Sumerians, Babylonians, and Assyrians constitute a unique record of daily life, of history, and of human thought through 3000 years. See ALPHABET; ARAMAIC; HIEROGLYPHICS; LANGUAGE; PICTURE WRITING; WRITING.

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CUNENE RIVER, or **KUNENE,** SW Africa, rises in W central Angola on the Bihé Plateau, flows generally S and then W to the Atlantic Ocean, forming part of the border between Angola and South-West Africa. The river is about 650 miles long and has numerous cataracts.

CUNEO, province, NW Italy, Piedmont, bounded by France on the SW and W, and the provinces of Turin on the N, Alessandria on the E, and Savona on the SE; area 2669 sq. mi.; pop. (1954) 570,300. Cuneo consists largely of mountainous country, including part of the Maritime and Cottian Alps. Some of its peaks, such as Punta dell' Argentera, reach heights of 11,000 and 12,000 feet. The Col di Tenda (6145 ft.) is its most famous pass into France. Major rivers are the Tanaro, Gesso, Stura di Demonte, Varaita, and Maira, headstreams of the Po River. Considerable hydroelectric power is produced by these Alpine rivers. Agriculture is the principal occupation with grains, fruits, wine grapes, chestnuts, hemp, and fodder the principal crops. Cattle and sheep are the most important livestock. The province is noted for its silk production. Minerals in Cuneo include coal, graphite, and stone. Cuneo is the provincial capital; other major towns are Bra, Mondovi, Saluzzo, and Savigliano. A small portion of the province was ceded to France in 1947 under the terms of the Italian peace treaty.

CUNEO, town, NW Italy, Piedmont, capital of the province of Cuneo, at the confluence of the Gesso

Medieval houses line the narrow streets of Cuneo, the provincial capital. Founded in 1120, the city has been besieged many times because of its strategic importance.

EWING GALLOWAY

and the Stura di Demonte rivers, 47 miles S of Turin. Cuneo is a communications, market, and industrial center. Industries include the manufacture of textiles, particularly silks, food products, chemicals, and printed matter. Cuneo is noted as the distribution center for the important silk production of the surrounding area. The town has a cathedral, a technological institute, and numerous medieval buildings. It was founded by the Lombards in the twelfth century. Commanding the Tenda Pass over the Maritime Alps from Turin to Nice, Cuneo has since ancient times been of strategic importance and often has been besieged. Pop. (1954) 26,600.

CUNHA, EUCLIDES DA, 1866–1909, Brazilian writer, was born in Santa Rita do Rio Negro of middle-class parents. He was educated at the Colégio Aquino in Rio de Janeiro, where he met and was influenced by the republican leader Benjamin Constant. Cunha's academic background was both literary and scientific; he also attended a military school for a short time, but was expelled when, in the presence of the minister of war, he threw down his sword, declaring that "war is a monstrous thing . . . legalized banditry." There followed a career in journalism, a period in the army during the revolution, and work as a field engineer. While he was engaged in the latter occupation the Canudos rebellion broke out, 1897, and Cunha was asked to report on it for a São Paulo newspaper. This experience furnished the theme for Cunha's great book, *Os sertões* (1902), of which Samuel Putnam said ". . . it is one of the most remarkable books ever written. In the place it holds in the esteem and affections of an entire people it can only be compared to the *Divine Comedy* or *Don Quixote*." Each year during *la semana euclideana* (Euclides week) Brazil pays homage to Cunha; and the little engineer's shack in which he wrote the book has been preserved as a national shrine.

Os sertoes (translated as *Rebellion in the Backlands*, 1944) is a national epic which pictures a people and a country with an insight seldom equaled. Defying classification, the book is at the same time a remarkable piece of reporting, a treatise on the geology, geography, and anthropology of the Brazilian backlands, and an exciting account of a military campaign against a handful of pathetically outnumbered half-savages who managed to hold out for several months against a modern army. Cunha's attack on the barbarity of the "civilized" toward semibarbarians, was met with hostility from government and army leaders of his time, a circumstance usually associated with his mysterious assassination by a soldier shortly after he had begun to teach at the Pedro II Institute in Rio de Janeiro.

CUNHÃ, TRISTAO DA 1460?–?1540, Portuguese navigator. In 1506, while in command of a Portuguese expedition to Africa and India, he discovered the principal island in the Tristan da Cunha group (named in his honor); and visited Madagascar, Mozambique, and the coast of Zanzibar. He is celebrated in the tenth song of Camoëns' *Os Lusíadas*.

CUNNER, a group of small-mouthed fishes that range the Atlantic Coast from Newfoundland to the Gulf of Mexico, at depths of about 200 feet. The common cunner, *Tautogolabrus adspersus*, has a moderately thick body that is somewhat flattened sideways. The head is flat-topped and the fish has a pointed snout. The mouth and floor of the throat contain a patch of teeth which are used to grind the shells of mollusks and crustaceans; cunners are also scavengers in many harbors. The fish averages from 6 to 10 inches in length and weighs less than one-half pound. Females are longer than males of the same age. Spawning occurs from late spring to early summer.

CUNNINGHAM, ALLAN, 1784–1842, Scottish poet and biographer, was born in Keir Parish, Dumfriesshire. A skillful stonemason, he wrote poetry in his spare time. In 1813 he published *Songs, Chiefly in the Rural Dialect of Scotland*, followed in 1822 by *Traditional Tales of the English and Scottish Peasantry*. In 1825 he edited *The Songs of Scotland, Ancient and Modern*, which included his own famous ballad, "A Wet Sheet and a Flowing Sea." Among his other works was *Lives of the Most Eminent British Painters, Sculptors, and Architects* (1829–33).

CUNNINGHAME GRAHAM, ROBERT BONTINE, 1852–1936, Scottish author, laird, early Socialist member of parliament from Lanarkshire, and famous traveler and horseman, was born in London, a lineal descendant of the eighteenth century "Doughty Deeds" Graham of Gartmore. His early life was spent in South America, Mexico, and the American Southwest. Friend of Joseph Conrad and W. H. Hudson, he was more Elizabethan (he had Spanish blood on his mother's side) in his cavalier outlook than Edwardian or Georgian, and for nearly 60 years was a unique figure in London society. Cunninghame Graham's best known books, notably *A Vanished Arcadia* (1901) and *The Conquest of the River Plate* (1924), deal with South America. He wrote several biographies and an excellent travel book about Morocco, *Mogreb-el-Acksa* (1898). In his short stories and sketches he wrote with irony, tolerance, and compassion on the Scots in *Scottish Stories*, (1914); on cruelty to animals; success; British imperialism; and the more amusing foibles of human nature. He won the ear of discriminating readers, but by the nature of things was never popular. Although a wealthy aristocrat, he might be called the founder of the British Labour party with Keir Hardie, John Burns, and William Morris. Toward the end of his life he was titular head of the Nationalist party of Scotland, which aimed at home rule. He died in Buenos Aires and was buried in the ruins of Inchmahome Priory on the Lake of Menteith in Scotland.

HERBERT F. WEST

CUPELLATION. See ASSAYING, *Dry Assaying*.

CUP FUNGUS. See ASCOMYCETES.

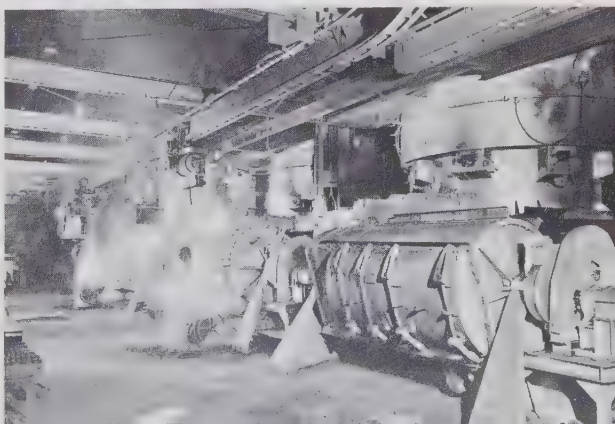
CUPID, in Roman mythology, the god of love, almost identical with the Greek Eros. The son of Venus and Mercury, Cupid was often represented as a beautiful winged boy carrying a bow and a quiver of arrows (the darts of love), with which he pierced the hearts of lovers. As *Amor* he is shown as a mischievous winged infant; in this guise he was most often shown by painters of the Renaissance (as in Bordone's *Daphnis and Chloë*, 1550). See PSYCHE.

CUPOLA, a metallurgical furnace used primarily for melting cast iron in foundries. It resembles a miniature blast furnace (see BLAST FURNACE). Most cupolas are supported on legs so that the bottom can be dropped for cleaning and repairing. They are generally operated intermittently, although continuous operation also is possible.

The charge is composed of coke, limestone, pig iron, and usually some steel scrap. These are added in alternate layers through a charging door. Air is

Continuously operated cupolas in a tractor plant assure a steady supply of molten iron as needed. The iron is poured into delivery ladles from 10-ton holding ladles.

CATERPILLAR TRACTOR CO.



blown in through holes (tuyeres) near the bottom of the cupola to support combustion of the coke. Heat from the burning coke melts the charge, and the molten lime combines with the coke ash to form a slag. Metal and slag drip down through the charge, the metal collecting at the bottom. The slag rises to the top of the metal and is tapped off through a hole located just below the tuyeres; the iron is tapped through another hole at the bottom of the cupola into ladles, from which it is conveyed to the casting molds (see CASTING).

Many of the early Bessemer steel plants used cupolas for melting cold pig iron to supply the converters, but this practice gave way to use of molten metal direct from a blast furnace.

CUPPING PROCESS. See DRAWING, METALLURGICAL.

CUPRIC SALT. See COPPER.

CUPRITE, an important ore of copper, sometimes called ruby copper or red copper. Its crystal generally exhibits the cube, octahedron, and dodecahedron. The axes have equal lengths that are at right angles with each other. (See CRYSTALLOGRAPHY.) The crystals have a luster between metallic and adamantine. The color is always a shade of red, clear ruby red in the transparent crystals. Cuprite has a specific gravity of 6 and a hardness of 3.5 to 4. The chemical formula of the mineral, which contains 88.8 per cent copper, is Cu_2O. An ore of secondary origin, it is usually found in the upper portions of copper veins. There are cuprite deposits of commercial importance in Australia, Bolivia, Chile, and the French Congo. In the United States cuprite is found at Bisbee, Clifton, and Morenci, Arizona.

CUPROUS SALT. See COPPER.

CURAÇAO, island in the Caribbean Sea, in the Netherlands West Indies; 50 miles E of the Paraguaná Peninsula of Venezuela; area 173 sq. mi.; pop. (1953) 114,683. The island extends about 40 miles from northwest to southeast and 7 miles at the maximum width. It is generally flat with some low hills; the highest point is 1220 feet above the sea. The basic formations are coral limestone and dikes of resistant lava. Curaçao has a tropical, semiarid climate. The mean annual temperature is 81°F and the annual precipitation averages 22 inches.

Agricultural products include hides, sisal, citrus fruits, and divi-divi. The peel of the native orange is used to produce the liqueur curaçao. Phosphates are mined. Ships, straw hats, tile, and cement are manufactured products. The most important industry is the refining of petroleum shipped to Curaçao from the Lake Maracaibo district of Venezuela. The capital, Willemstad, has a good harbor and is a transshipment point.

Curaçao was sighted by Amerigo Vespucci in 1499. It was settled by the Spanish in 1527 and captured by the Dutch in 1634. The island was occupied by the British during the Napoleonic Wars and returned to the Dutch in 1816. Although the official language is Dutch, the commercial tongue is Papiamento, a hybrid of Dutch, English, Spanish, and French. About 85 per cent of the inhabitants are Negroes or mulattoes. See NETHERLANDS WEST INDIES; WILLEMSTAD.

The pontoon bridge across the harbor entrance to Sint Anna Bay at Willemstad, Curaçao, swings open to admit tankers carrying Venezuelan oil to refineries on Isla Peninsula.

NETHERLANDS INFORMATION BUR.

CURAÇAO, a white, green, or yellow liqueur invented by the Dutch and produced principally in the Netherlands, France, Germany, and the United States. Its original flavor and bouquet was derived from the dried peel of the bitter green orange grown on the West Indies island of Curaçao, from which the liqueur takes its name. In making curaçao, orange peels are soaked in a spirit base for 24 to 48 hours; the mixture is then distilled in a pot still. Some manufacturers sweeten the distillate and add some orange juice. Two white curaçaos made in France are Cointreau and Triple Sec, but the most famous brand is Grand Marnier, a yellow curaçao made with cognac. The alcoholic content of curaçao ranges from 30 to 43 per cent.

CURARE is a drug that acts on the peripheral nervous system to relax the skeletal muscles. (See DRUG, *Classification of Drugs;* AUTONOMIC NERVOUS SYSTEM, *Function.*) Crude curare has long been used as a poison by Indians of the Orinoco and Amazon Basin areas of South America. Even a slight scratch from weapons treated with crude curare rapidly produces generalized paralysis and, as the muscles governing respiration fail, death.

Crude curare is a blackish-brown gummy substance obtained by brewing stems and barks of various tropical South American plants, mostly of the genera *Strychnos* or *Chondodendron.* Indian formulas for preparing curare are traditional, obscured in ritual, and often known only to the witch doctor or tribal chief. Thus the strength and composition of each batch of the crude preparations vary, making their use as a medicine impracticable. The Indians classify the crude preparations according to the container holding them, as tube, pot, and calabash curare; furthermore, each type is made up of chemically different alkaloids. From the native tube curare an alkaloid called tubocurarine was isolated, and researchers in 1943 finally obtained the same substance from the plant *Chondodendron tomentosum.* Isolation of the pure alkaloid made possible an accurate determination of the pharmacological properties of curare.

Action and Use. Injections of curare cause a gradual paralysis of the skeletal muscles by preventing their response to motor nerve impulses, until the victim is helpless. The muscles of respiration are the last to be affected, but eventually breathing becomes weak and irregular, and finally ceases. Curare is rapidly destroyed in the body; if a moderate amount has been injected the action begins to decline in about 20 minutes. In emergency conditions from an overdose of curare, life sometimes can be maintained with artificial respiration or by forcing air into a tube inserted in the trachea. See PARALYSIS; MUSCLE.

The chief therapeutic use for curare preparations is to promote muscular relaxation in general anesthesia. In spastic conditions or disorders in which muscular rigidity and tremor occur, administration of curare derivatives may bring about temporary relief from pain. Curare preparations are used in shock therapy to maintain muscle relaxation without impairing the effects of the treatment. Violent muscular contractions may also be diminished by curare, which does not, however, affect the basic cerebral phenomena causing them.

Curaré, prepared from *C. tomentosum,* and intocostrin, its purified, colorless extract, contain four inactive tertiary crystalline bases and a highly active quaternary base, d-tubocurarine ($C_{19}H_{21}O_4N$). The d-tubocurarine is a bitter and colorless crystalline powder, soluble in alcohol. Its salts are soluble in water.

BIBLIOG.–R. C. Gill, *White Waters and Black Magic* (1940); A. R. McIntyre, *Curare: Its History, Nature, and Clinical Use* (1947).

CURASSOW, a group of large Central and South American birds belonging to the family *Cracidae*, that also includes the guans and chachalacas. Most curassows are dark-colored birds. Their nests are made of sticks, grass, and leaves; two to five eggs are laid. The birds feed on fruit, buds, insects, and worms. The curl-crested curassow, *Crax alector*, is about as large as a domestic turkey and blackish in color. These birds are good to eat but attempts to domesticate them have been unsuccessful.

CURB MARKET, a securities market formerly conducted along a curb or street. Curb markets sprang up in such financial centers as Amsterdam, London, Paris, Boston, and New York when dealers and brokers met informally outdoors to trade in securities. Most of the leading stock exchanges, including the New York Stock Exchange and the American Stock Exchange, were originally conducted along streets but are now organized indoor markets. The New York Stock Exchange started as a curb market in the vicinity of Wall Street in 1792. The American Stock Exchange, known for many years as the New York Curb Market, originated before the Civil War among brokers who met at all hours outside the New York Stock Exchange building. Later located on William Street, it moved to Broad Street in 1880. After 1900 trading was restricted to the hours between 10 and 3, and in 1911 a membership association with rules and regulations was formed. In 1921 the curb market was moved into its own new building on Trinity Place. See Stock Exchange.

CUREPIPE, city, Mauritius Island, in the Indian Ocean. Located on the central plateau and connected by rail to Port Louis, the capital, Curepipe is chiefly a health resort. A military post is located here. Pop. 27,468.

CURES, ancient Sabine town, W central Italy, 25 miles NE of Rome. Numa Pompilius and Titus Tatius, legendary figures in early Roman history, both came from Cures.

CURETES, in Greek mythology, young male divinities who were attendants of the earth mother, Rhea. They were charged with the protection of her infant Zeus from the murderous intent of his father, the Titan Cronus. See Zeus.

CURFEW, from the French *couvrir*, to cover, and *feu*, fire. It was a common practice in medieval Europe to ring a bell at nightfall as a signal to the townspeople to cover their fires, extinguish lights, and retire, thus safeguarding the wooden houses. The practice was introduced into England by William the Conqueror; it was abolished in 1100 by Henry I because of popular opposition. Nevertheless the custom persisted as a means of informing the people of the time in the evening, and in certain parts of England the curfew bell is still rung at 9 o'clock. Police and military authorities often use the curfew (now usually signaled by a whistle) to keep people off the streets during late evening and night hours during political disturbances, as in Northern Ireland after World War I and in Palestine after World War II. In January 1956 a dusk-to-dawn curfew was imposed on Bombay, India, following savage attacks on police by rioters. Curfews also have been used during wartime as a means of saving power and fuel. In the United States the curfew is employed in some towns to designate the time of day. In the pre-Civil War South the curfew was a warning to slaves to keep off the streets unless they held passes from their masters. After 1900 many municipalities throughout the country adopted curfew ordinances to keep children of a specified age group off the streets without the written consent of their parents. This practice was revived during and after World War II. See Juvenile Delinquency.

CURIA RHAETORUM. See Chur.

CURICÓ, province, central Chile, bounded by the province of Colchagua on the N, Argentina on the E, the province of Talca on the S, and the Pacific Ocean on the W; area 2215 sq. mi.; pop. (1952) 89,391. Agriculture and livestock are important in the economy of the province. The Mataquito and the Lontué rivers form its southern boundary. The principal cities are Curicó, the capital, and Llico, a resort.

CURICÓ, city, central Chile, capital of the province of Curicó, in the central valley, about 116 miles SSW of Santiago. This inland agricultural center, settled in 1743, has a large livestock market, flour mills, and distilleries. In 1928 the city was largely destroyed by an earthquake and rebuilt. Pop. (1952) 26,773.

CURIE, IRÈNE. See Joliot-Curie, Irène.

CURIE, MARIE SKLODOWSKA, 1867–1934, and **CURIE, PIERRE,** 1859–1906, French physicists, co-discoverers of radium. The daughter of a professor of physics, Marie Sklodowska was born in Warsaw, Poland, and was educated there at the Museum of Industry and Agriculture. She went for advanced study to the Sorbonne in Paris where she met and married Pierre Curie, a professor of physics, in 1895.

UP

Co-winners of the Nobel prize in physics in 1903 for their discovery of radium, Pierre and Marie Curie are shown here with their daughter Irène, later a Nobel winner herself.

After the discovery of radioactivity, 1896, by Antoine Henri Becquerel, Marie chose for her doctoral dissertation to continue Becquerel's investigations, testing most of the known elements for radioactivity and finding that thorium and uranium were the only ones whose compounds produced significant ionization (see Ion). In further investigations of uranium (contained in pitchblende ore) she noticed that the ore was much more radioactive than was to be expected from an analysis of its uranium content; this led her to believe that the pitchblende must contain another radioactive element, as yet unidentified. Pierre Curie then joined his wife in the laborious search for the new element, a project which required minute analysis of great quantities of the complex ore. Finally, in 1898, the Curies were satisfied that they had isolated the new element and named it *polonium*, after Marie's birthplace. At the same time, during numerous fractionations of barium chloride, they discovered another radioactive substance, which they called *radium*. After four years of work and the processing of eight tons of pitchblende they isolated a gram of pure radium salts and were able to determine the atomic weights of radium and polonium. In recognition of their discovery they shared the 1903 Nobel prize in physics with Becquerel. While Marie continued her investigations of radium chloride, Pierre studied the physical properties of the rays emitted by the new substances and became convinced

of their therapeutic value. He presented several important papers on the subject before physicians and demonstrated the efficacy of the rays in healing certain types of skin lesions.

After Pierre's death in an accident, 1906, Marie was appointed his successor as professor of physics at the Sorbonne, becoming the first woman to hold such a position in a French university. She continued her research and in 1911 won another Nobel prize, this time in chemistry, for successfully isolating pure metallic radium. She was assisted, after 1918, by her elder daughter Irène, 1897–1956, who later married the physicist Frédéric Joliot (and who, with her husband, was awarded the 1935 Nobel prize in chemistry, for their discovery of artificial radioactivity). Up to 1956, Madame Curie was the only person to have won two Nobel prizes.

The principal writings of Madame Curie were *Le Polonium et le radium, leur découverte par les rayons de Becquerel* (1899); *Recherches sur les substances radioactives* (1904); *Traité de radioactivité* (1910). The story of her life has been told by her younger daughter, Eve, in *Madame Curie* (1937). See BECQUEREL, ANTOINE HENRI; POLONIUM; RADIUM; RADIOACTIVITY. F. D.

CURITIBA, formerly Curityba or Corityba, city, SE Brazil, capital of the state of Paraná, 212 miles SW of São Paulo, connected by railroad with the port of Paranaguá on the Atlantic Ocean. Situated at an elevation of 3000 feet, Curitiba has a mild climate. It is a commercial trading center for maté, coffee, lumber, and livestock. Industries include the manufacture of textiles, paper, furniture, and wood products; metalworking; brewing; and sugar refining. The city was founded in the middle of the seventeenth century as a gold mining center. It has a large German, Italian, and Polish population. Pop. (1950) 141,349.

CURIUM, the element with atomic number 96, and symbol Cm, was discovered in 1944 by G. T. Seaborg, R. A. James, and A. Ghiorso as the result of the bombardment of plutonium with alpha particles (see ATOM, *Transmutation*):

$$_{94}Pu^{239} + {}_{2}He^{4} \rightarrow {}_{96}Cm^{242} + {}_{0}n^{1}.$$

The element is the seventh member of the actinide transition series (see PERIODIC TABLE), and is named after Pierre and Marie Curie. See CURIE, MARIE SKLODOWSKA.

The properties of curium parallel those of the members in the lanthanide series (see LANTHANIDE SERIES), especially the element gadolinium. The +3 valence state of curium is stable, forming compounds with the halogens of the general type CmX_3. All of the isotopes (see ISOTOPE) of curium are radioactive, with half lives varying from hours to years. The isotope with a mass number of 242 (see MASS NUMBER) and a half life of 162 days, has been formed in weighable amounts by neutron irradiation of americium:

$$_{95}Am^{241} + {}_{0}n^{1} \rightarrow {}_{96}Cm^{242} + {}_{-1}e^{0}.$$

These nuclear reactions were accomplished with a cyclotron. See ELECTRON AND ION ACCELERATORS, *Cyclotron.* GLENN T. SEABORG

CURLEW, any one of several large shore birds belonging to the genus *Numenius*. The curlews have long down-curved bills and elongated legs. Although they are found along the shore, they breed upland. The nest is usually in the open. The plumage of most species is pale brown with dark streaks and white markings; the body is largely white beneath. The loud-whistling curlew, *N. americanus*, ranges from Texas to South Carolina. It is 20 to 26 inches in length and its bill is about 6 inches long. The Hudsonian curlew, *N. phoeopus*, breeds in Arctic regions and migrates as far south as South America. It is 15 to 18 inches long with a bill of about 4 inches. The Eskimo curlew, *N. borealis*, is practically extinct. It is occasionally sighted along the northern coast of New England.

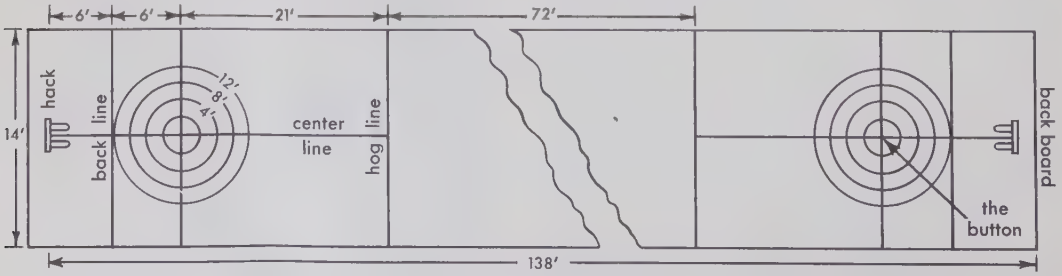
Long-billed Curlew

CURLING, a winter ice sport somewhat resembling bowling in physical action. Of disputed origin, it is claimed by both Scotland and Flanders, with the weight of evidence favoring Scotland, where curling stones bearing the date 1551 have been found. In Canada the game was first played about 1807 and reached the United States 13 years later. As a minor national sport in Canada, curling has some 175,000 participants; its growing popularity in the northern United States is attested to by more than 70 clubs and 7500 players. Important Canadian meets are the Manitoba and Quebec International bonspiels; the Gordon International Medal matches, instituted in 1888, annually pit Canadian against U.S. teams.

Curling rinks measure 38 yards between the centers of the houses (circled target areas) and 42 yards overall. Curling stones, of polished granite and weighing from 39 to 43 pounds, are dished at top and bottom, have a rough and smooth side, and are fitted with reversible handles. Four men form a team, led by a "skip" or captain who directs team strategy. Each player delivers two stones alternately with his opponent, with the skip using a broom as a target, clearing the ice in front of the moving stone and calling for inturns, outturns, running shots, and so on. Delivery of all stones by both teams constitutes an "end," with 10 or 12 ends comprising most games. Points are counted for all stones remaining within the house after an end is completed. An important feature of the game is the condition of the ice, which is constantly swept clean and frequently "pebbled" by sprinkling; the speed of the ice determines which side of his stone, sharp or smooth, a player uses in controlling the curling action of his shots.

BIBLIOG.–F. B. Talbot, *Mr. Besom Starts Curling* (1936); W. A. Creelman, *Curling, Past and Present* (1950); H. E. Weyman, *Analysis of the Art of Curling* (ed. 1953).

CURRAN, JOHN PHILPOT, 1750–1817, Irish orator and judge, was born in Newmarket, County Cork. He was appointed king's counsel and entered the Irish parliament in 1783. Although a Protestant,



Scale Drawing of Curling Rink

Curran supported Roman Catholic emancipation. During the government prosecutions of leaders of the rebellion of 1798, Curran conducted a brilliant and bold defense on their behalf. After the arrest of Robert Emmet, a leader of the rebellion, 1803, Curran was accused of being an accomplice, but was acquitted by the privy council. Later he was master of the rolls in Ireland and a member of the privy council, 1806–13.

CURRANT, a hardy bush of the genus *Ribes* which is grown extensively in temperate countries. The red and white fruited varieties, *R. sativum*, are chiefly grown for use in jellies, jam, and desserts. The black currant, *R. nigrum*, is rich in vitamin C. Currants grow best in the cooler, humid climate of the northern half of North America. Currant bushes are propagated by stem cuttings about 8 inches long from the ripened wood of the preceding season's growth. In starting a new plantation, one-year-old plants give the best results. Currants do best on a rather heavy, moist clay or silt loam. Autumn planting is advised. The plants are set in rows about 6 feet apart and 4 feet distant in the row. They require frequent shallow cultivation during the growing season. In pruning, from four to eight canes are maintained in each hill, all the three-year-old or four-year-old canes being removed. The plants respond to such fertilizer as barnyard manure. Popular varieties of currants include Stephens No. 9, Red Lake, Perfection, Wilder, Cherry, and Fay in the reds, White Grape and White Dutch in the whites, and Boskoop Giant, Climax, and Kerry in the blacks. The blister rust of white pine trees uses the currant bush as its host plant; consequently some areas have laws restricting the planting of currant bushes. See Gooseberry.

CURRENCY. See Money.

CURRENCY EXCHANGE, a place of business engaged in cashing payroll checks and providing such services as the sale of money orders, the remitting of payments of household utility bills, and the notarizing of documents. The exchanges became widespread in Chicago and other cities in the United States after the bank holiday in 1933. An extension of this business is the cashing of checks from armored vehicles at industrial plants.

CURRENT, ELECTRIC. See Electric Circuit; Electrodynamics.

CURRENT, OCEAN. See Ocean.

CURRENT RIVER, S central United States, rises in the Ozark Plateau in SE Missouri and flows SE through Missouri and into Arkansas, where it joins the Black River near Pocahontas. Its total length is about 225 miles.

CURRICULUM, the over-all organization of courses and activities planned by a school for its students. The traditional school curricula emphasized subject matter, as represented by the three Rs. Programs of curriculum development after the 1920s were based largely on the contributions of educational psychology, which highlighted the existence and the importance of individual differences and established the fact that no one course of study could be suitable for all students. Modern educators have concluded that curricula should be flexible and varied to fit the backgrounds, purposes, and capacities of pupils. In addition school programs take into account the social, civic, occupational, economic, and cultural activities of the students and their families.

Efforts to provide subject matter to fit individual differences led to the inclusion of additional courses and activities, particularly vocational and technical studies, in the curriculum. At the same time there were attempts to co-ordinate existing courses to eliminate false barriers between subject matter fields. The seeming failure of modern curricula to meet the needs of the most able students has also been criticized; and it has been claimed that curricula too often present systematic schemes for mass education and for shallow, utilitarian purposes.

CHICAGO BOARD OF ED.

Familiarity with road signs and driving conditions is an important preliminary to actual driving by students of Chicago's Lane Tech High School driver-training course.

The contrast between the American and the English and European theories of education is nowhere more apparent than in curricula. The programs in European countries are based on the belief that minds of the highest quality should be exercised upon materials that are not utilitarian, to develop their capacities to explore knowledge for its own sake. Curricula for secondary schools are planned for the small percentage of students who qualify scholastically and from whom university students will be selected. In the United States, curricula are built on the philosophy that education for all is essential for a democratic society.

The curriculum is the product of social evolution's effect on the schools. For example, the establishment of courses in agriculture in the United States was an outgrowth of the lessons of the Civil War, when the nation's food supply was in jeopardy. Programs to cultivate the mechanical arts were the result of appeals from manufacturers and the U.S. Chamber of Commerce. Courses ranging from driver training to water safety have been added to curricula to meet growing and changing needs. The demands of pupils, parents, civic groups, clubs, and organizations have been powerful influences in determining the content of curricula.

Curriculum Development has followed changes in the theories of the purpose of education. The colonial Latin grammar schools and early academies were founded to prepare men for the Christian ministry, and so the curricula emphasized Latin and Greek. Later academies also provided education for a vocation. In the latter half of the nineteenth century the purpose of education was seen as mental discipline and the acquisition of "knowledge for its own sake," and the curriculum included a limited number of subjects to be studied (memorized) from textbooks, which were encyclopedic.

As early as 1888 Charles W. Eliot urged reform of the secondary curriculum because of the dominance of the college entrance requirements and the waste of student time resulting from the haphazard growth of courses of study. In 1893 the Committee of Ten (on secondary education) and the Committee of Fifteen (on elementary education) were appointed by the National Education Association to study the situation. Their reports urging uniformity of courses started a generation of committees, whose studies largely expressed fear of change. After 1920 several American foundations granted money for the survey of school practices in curriculum making. Cities such as Winnetka, Ill., Denver, Colo., Detroit, Los Angeles, and St. Louis were influenced by these reports.

Curriculum study in elementary and secondary schools reached a peak between 1930 and 1940, many cities establishing permanent committees on curriculum development. The elementary schools still of-

CHICAGO SUN-TIMES

Nearly a hundred Chicago elementary schools have made foreign language an elective subject in their curricula. Here a first-grader tries out his Spanish pronunciation.

fered the three Rs, attempted to teach them more effectively, and added the teaching of skills to help pupils learn to live together and prepare for useful citizenship.

The tendency in curriculum development has been to cut down the number of individual studies and to expand the area covered by each. History, geography, economics, and civics commonly are reorganized into a broad department called social studies. The study of arithmetic, geometry, algebra, graphic methods, and related subjects are grouped under general mathematics. Physiology, hygiene, athletics, and physical training are grouped under health; and oral speech, reading, writing, and literature under language arts or communication skills. These changes represent a trend toward a curriculum consisting of a few broad areas of knowledge, activities, readings, and research, and has been given several descriptive names such as "broad fields," "fused," "correlated," and "core." The latter term has had the most widespread acceptance; however, "core curriculum" also has been used, especially at the college level, to describe that body of knowledge or experience which every student should have before graduation.

Later Trends. A new orientation has been evident in curriculum development for intercultural education and human relations, for the role of the United States in foreign affairs, for technology and applied science, for geography, and for consumer education. Changes in emphasis in areas such as history, political science, and economics (the social sciences) took place also.

The elementary and secondary schools have been beset with requests, demands, and legislation to do seemingly conflicting things. A desire for more emphasis on the fundamentals has been accompanied by an equally ardent desire for the school to perform more of the functions of a social institution, such as providing health services, school lunches, and social guidance. Statutory requirements were maintained and increased in the period after World War II. Frequent legal requirements included those enacted for the teaching of the fundamentals—reading, writing, mathematics; the effects of alcoholic drink; federal and state constitutions; history and patriotism; agriculture; physical education and hygiene; and Bible reading. Professional opinion has usually preferred curriculum revision from within the school to legislative prescription.

Curriculum planning and development is no longer visualized as the sole prerogative of the professional staff of the schools. Expanded enrollments, the need for additional funds and facilities, and the widespread debate on the validity of education programs combined to create great popular interest in education. This interest has been accompanied by a meteoric rise in the number of lay citizens active in working with teachers and administrators in the development of programs of study and curricula for individual communities. See EDUCATION; EDUCATIONAL SYSTEMS, Education in the United States.

JACK R. CHILDRESS

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CURRIE, SIR ARTHUR WILLIAM, 1875–1933, Canadian soldier and educator, was born in Napperton, Ont. During World War I he commanded the second Canadian infantry brigade in France, and later was commander of the Canadian Corps, 1917–19. Created a baronet for his services, Currie was principal of McGill University, 1920–33.

CURRIER AND IVES, a firm of American lithographic publishers founded by Nathaniel Currier (1813–88). Born in Roxbury, Mass., Currier was apprenticed in 1828 to the first successful American lithographing firm, established in Boston by William and John Pendleton. At 20 Currier went into business for himself in Philadelphia. A year later he moved to New York where, after operating briefly as a partnership, he again went into business for himself. A New York disaster inaugurated Currier's fame, for within the incredibly short period of four days after a fire he printed *Ruins of the Merchants' Exchange, New York: After the Destructive Conflagration of Dec. 16 and 17, 1835.* The lithograph was sold as an extra with the *New York Sun.* Yet another tragedy established a national market for Currier's work. His depiction of the burning of the steamboat *Lexington,* issued three days after the fire, complete with seven columns of description and a map, created so great a demand that his presses were kept running day and night. In 1857 Currier took his brother-in-law, James Merritt Ives (1824–95), a New York artist, into partnership.

Serving as the picture newspapers of their day, Currier and Ives prints were immensely popular; one print of *Darktown Comic* sold over 73,000 copies. The lithographs were printed in black and white and colored by hand. They were sold by pushcart peddlers and by country stores; from a London distributing house they were purchased by merchants in all parts of the Continent. The appeal of the prints lay in their subject matter, which stressed death, danger, or sentiment. The hazards of life on the frontier, fires, shipwrecks, and express trains were favorite themes. In addition the firm printed humorous caricatures, political cartoons, marriage certificates, and "God Bless Our Home" mottoes. The staff included such artists as Arthur Fitzwilliam Tait, Thomas Worth, Charles Parsons, and Thomas Nast.

After Nathaniel Currier's retirement in 1880 he was succeeded by his son, Edward West Currier. At James Ives' death in 1895, his son, Chauncey, took his place. Neither descendant was especially interested in the business and they soon sold out to Daniel Logan, who retained the firm name. But by 1907 the camera had so far usurped the place of the comparatively slow lithographic stone that Logan was forced to liquidate the business. Many Currier and Ives prints later became collector's items. Originally selling from 25 cents to $3, some of the lithographs (such as *The Life of A Hunter—A Tight Fix*) were known to bring as much as $3000.

CURRIER AND IVES

W. RUSSELL BUTTON

Marking the height of the sailing vessel era in the mid-1850s was this Currier and Ives print of the clipper ship *Great Republic*.

***Central Park—Winter*, a Currier and Ives print of 1862, depicts winter sports in New York City during the early Civil War years.**

Melting snow presages the coming of spring in *The Farmer's Home—Winter*, one of many Currier and Ives prints of rural America.

W. RUSSELL BUTTON.

Currier and Ives prints were a fine medium for showing the American scene. One of their prints which depicted the continuous westward flow of population was *Across The Continent*.

W. RUSSELL BUTTON

CURRY, JOHN STEUART, 1897–1946, U.S. painter, was born in Dunavent, Kan., and spent his early youth on his father's stock farm. He studied at the Art Institute of Kansas City; in Chicago; and later, after working as an illustrator, in Paris. Following his return from Europe Curry became one of the leading painters in the regionalist movement of the 1930s, and joined with Thomas Hart Benton and Grant Wood in protesting against imported (European-influenced) painting techniques. Curry's style was romantic-realist genre painting; his homely, midwestern subject matter was romanticized through the use of unexpected color patterns and almost stylized backgrounds. *Baptism in Kansas* exemplifies his best work.

CURRY, a highly seasoned powder or paste containing turmeric, cayenne pepper, black pepper, ginger, coriander, and other spices. It has been used for many centuries to season meat and rice dishes in India and Ceylon and other countries in the East. Its characteristic yellow color is imparted by the turmeric. In modern times the use of curry has spread to western countries. See Turmeric.

CURSOR MUNDI, "Courier of the World," a religious epic of 24,000 lines written in the northern English dialect about 1300, tracing world history from the creation through biblical times to the Middle Ages. The general theme is man's redemption. The poem is a great storehouse of legends.

CURTESY, the life estate to which a husband is entitled according to the common law in all of his wife's real estate of which she was seised or the absolute owner during their marriage, provided there has been issue born of their marriage. Curtesy attaches to equitable estates as well as to legal estates, unless the conveyance establishing the trust expressly excludes the husband. The requirements to entitle the husband to curtesy are: (1) legal marriage continuing until death of the wife; (2) seisin of an estate of inheritance by the spouse; (3) issue born capable of inheriting. It is not necessary for the child to be living at the time of the mother's death, or even to have lived any appreciable time, if it were born alive.

In the United States curtesy or an analogous estate is generally provided by state statutes, varying in their provisions as to the amount of the estate, property subject thereto, and requirements. In many states it is not necessary that a child be born of the marriage.

CURTI, MERLE, 1897– , U.S. historian, was born in Papillion, Neb. A professor of history at the University of Wisconsin after 1942, Curti received the 1944 Pulitzer prize in history for his *Growth of American Thought* (1943).

CURTIN, ANDREW GREGG, 1817–94, U.S. public official, was born in Bellefonte, Pa. He was graduated from Dickinson College and was admitted to the bar in 1830. Entering politics, he became one of the state's foremost leaders of the Whigs, and later of the Republican party. He is remembered chiefly as governor of Pennsylvania, 1861–66, in which capacity he gave efficient and valuable support to the national administration during the Civil War. After the war he was United States minister to Russia, 1869–72. He supported Horace Greeley for president in 1872 and was a Democratic congressman, 1881–87.

CURTIS, BENJAMIN ROBBINS, 1809–74, U.S. jurist, was born in Watertown, Mass. Appointed to the U.S. Supreme Court in 1851, he sat as an associate justice while his brother George Ticknor Curtis (1812–94) defended Dred Scott before the court, 1857. Benjamin Curtis' dissenting opinion in the famous case was said to have been so effective that the majority decision was revised to answer his arguments. There followed a controversial correspondence on the case between Curtis and Chief Justice Roger Brooke Taney, after which Curtis resigned. After 1857 Curtis argued 54 cases before the U.S. Supreme Court and 80 before the supreme court of Massachusetts. He was a counsel for President Andrew Johnson in the impeachment trial before the U.S. Senate, 1868. Curtis published several collections of law reports. See Dred Scott Case.

CURTIS, CHARLES, 1860–1936, thirty-first vice-president of the United States, was born in North Topeka, Kan. After the death of his parents, Curtis spent his youth with the Kaw Indian tribe of his mother. He practiced law in Topeka, was county attorney, 1884–88, and served in the U.S. House of Representatives, 1893–1907. Elected a U.S. senator in 1907, Curtis was re-elected in 1914, 1920, and 1926. Curtis was vice-president of the United States under President Herbert Hoover, 1929–33.

CURTIS, CYRUS HERMANN KOTZSCHMAR, 1850–1933, U.S. publisher, was born in Portland, Me. After being associated with various Boston newspapers, he moved to Philadelphia in 1876 and there established *The Ladies' Home Journal*, 1883. His Curtis Publishing Company, formed in 1890, acquired *The Saturday Evening Post* in 1897 and *The Country Gentleman* in 1911. Curtis also developed a chain of newspapers including the *New York Evening Post* and the *Philadelphia Enquirer* and was interested in a number of enterprises outside publishing.

CURTIS, GEORGE WILLIAM, 1824–92, U.S. author, was born in Providence, R.I., and educated at the Brook Farm community, where he associated with Ralph Waldo Emerson and other transcendentalists. In 1846 he traveled in Europe and the Near East as correspondent of the *New York Tribune*, becoming a staff member on his return to America in 1851. He first became prominent with the publication of *Nile Notes of a Howadji* (1851), a description of his travels, and *Lotus Eating* (1852), a collection of letters about his experiences at various resorts. These were followed by his popular *Prue and I* (1856), a series of romantic reveries, and *Potiphar Papers* (1853), an amiable satire on New York society. Curtis became a lecturer in 1853 and was especially successful as an abolitionist speaker. After the Civil War he was active in the fight for women's rights and civil service reform. His *Duty of the American Scholar to Politics and the Times* (1856) was a significant declaration of the scholar's social responsibility.

CURTIS ISLANDS. See Kermadec Islands.

CURTISS, GLENN HAMMOND, 1878–1930, U.S. inventor and aviator, was born in Hammondsport, N.Y. He opened a motorcycle factory in 1902 and in 1907 established the world's motorcycle speed record of 137 mph. Meanwhile Curtiss' engines had become well known; in 1908 U.S. Army dirigible No. 1, powered by a Curtiss engine, passed its test. As director of experiments for the Aerial Experiment Association Curtiss designed the airplane *June Bug*, with which he won the Scientific American trophy in 1908. He also won the Gordon Bennett and *Prix de la Vitesse* speed awards with a Curtiss biplane, 1909, and the *New York World* prize of $10,000 in 1910 for a flight from Albany to New York City. Curtiss developed the hydroplane, 1911, and the flying boat, 1912. During World War I Curtiss combat planes were used by the United States, Great Britain, and Russia. His NC-4 flying boat was the first airplane to cross the Atlantic Ocean, 1919. From 1928 until his death Curtiss was a director of the Curtiss-Wright Corporation.

CURTIS TURBINE. See Turbine, Steam, *Modern Turbine Types.*

CURTIUS, ERNST, 1814–96, German classical scholar, was born in Lübeck. His studies were all directed toward Grecian antiquity and he visited Greece repeatedly on archaeological missions, after making an agreement with the Greek government giving Germany exclusive rights to the excavations at Olympia. He was professor of history and classical philology at Berlin and Göttingen and from 1844 to 1850 was tutor to the crown prince of Prussia, afterward Frederick III. His major works were *Peloponn-*

nesos (1851), an archaeological survey of the peninsula; and *History of Greece* (1857–62), a popularized summary of the results of scholarly research.

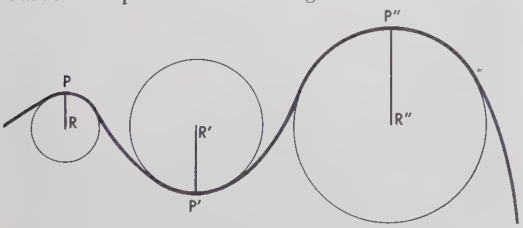
CURTIUS, GEORG, 1820–85, German philologist, was born in Lübeck. Like his brother Ernst Curtius, he was primarily a classical scholar but devoted himself to linguistic research rather than archaeology. As professor of classical philology at the universities of Prague, Kiel, and Leipzig, he became famous for his application of the comparative method to the study of Greek and Latin, and included among his students some of the most distinguished philologists of the nineteenth century. His most notable works were *Sprachvergleichende Beiträge zur griechischen und lateinischen Grammatik*, 1846 (*Comparative Studies in Greek and Latin Grammar*) and *Das Verbum der griechischen Sprache*, 1873 (*The Greek Verb*). His *Griechische Schulgrammatik*, 1852 (*Greek Grammar*), became a standard text in Germany and also appeared in English editions.

CURVATURE. See CURVE.

CURVE, a continuous line that constantly changes direction. The circle, parabola, ellipse, and hyperbola are examples of simple curves. Like many curves, their area, length, and position in space can be determined by their respective mathematical equations. (See CONIC SECTION.) Curves such as the cissoid and cycloid (see CISSOID; CYCLOID) are more complex, but nevertheless their construction and mathematics have been accurately determined. The cissoid was used by Diocles of Alexandria in 100 B.C., and Ptolemy in A.D. 200 explained the motion of the planets with the curves of the cycloid. A curve may be drawn with any shape, area, or length; the resulting curve may have a great aesthetic value and practical application in the fine arts, but if it cannot be reproduced or expressed with a suitable mathematical equation it will have no practical or physical usefulness in science or engineering. Analytic geometry and calculus provide a system for determining the equation which will define a particular curve. See ANALYTIC GEOMETRY; CALCULUS.

Curves are used to explain or illustrate many natural laws. A ball thrown upward will follow the path of a parabola during its ascent and descent. An exponential curve illustrates the exact manner in which a radioactive material decays. (See EXPONENT, *Exponential Functions*.) With the aid of the equation for an exponential curve, the scientist can predict the amount of radioactive material remaining after a period of time. (See RADIOACTIVITY, *Half Life*.) Statisticians rely upon the frequency distribution curve to summarize the characteristics of large groups of data. A number of simple curves may comprise a more complicated curve. In music the periodic vibrations of the fundamental frequency follow the path of a simple sine wave (see TRIGONOMETRY, *Curves of Functions*), but when the frequency is played on a musical instrument the vibrational characteristics of the instrument are superimposed upon the fundamental frequency to make a complex wave pattern, or curve.

Curvature is a characteristic property of a plane curve and is a rate of change of directions of a line. A plane has a curvature of zero. A circle or ellipse has a positive curvature, whereas the saddle-shaped curve of a parabola has a negative curvature. The amount of curvature possessed by a particular curve is determined by its radius of curvature. Curvature is also the reciprocal of the radius of curvature. Thus a small curvature would be associated with a large radius of curvature and a small rate of change of direction of the curve. A small radius of curvature would indicate the curve has a large rate of change of direction, or a large amount of curvature. The radius of curvature of a given arc of a curve may be determined by drawing a circle that best fits the arc (see Fig.). The curvature K equals the reciprocal of the radius R, or $K=1/R$. This method has inaccuracies because it is not always possible to determine the best fit between the circle and the arc. However, if the mathematical equation is known for the curve, calculus can be used to determine an accurate curvature for every point on the curve.



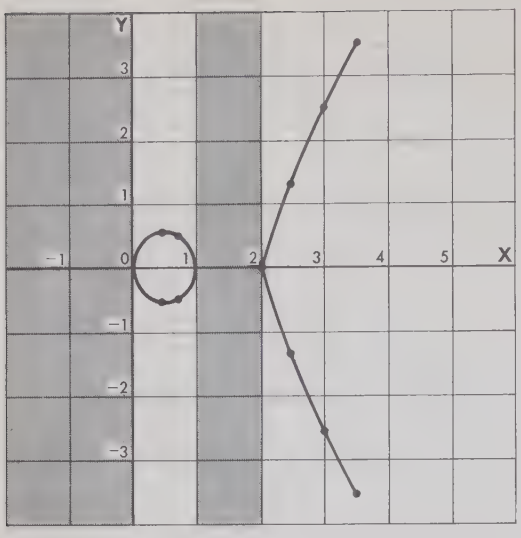
Determining the Radius of Curvature of a Curve

CURVE FITTING, methods of finding a formula or functional relationship (see FUNCTION) which analytically represents a table of empirical or statistical data. Some type of formula that will accurately represent the data is suggested by the graph of the data or study of the table. When the data is charted and the graph appears to be a straight line, it can be shown that the two sets of data, x and y, are related by the linear equation $y = ax + b$. The next step is to determine the coefficients a and b so that there will be a minimum of difference between the values of y obtained from the formula, and the original values in the table. In solving for a and b, a number of equations of the form $y = ax + b$ are written for each set of empirical data. The equations are then divided into two nearly equal groups and the average equation for each group is obtained. These two equations are then solved simultaneously for the values of a and b (see EQUATION, *Simultaneous Equations*). A more accurate method requires that the sum of the squares of the difference between the calculated and observed data be a minimum. See LEAST SQUARES, METHOD OF.

For less simple relationships between the variables represented by x and y, various other types of curves may be assumed (see CURVE), and the analysis either follows the procedures mentioned above or other methods involving calculus. Once a suitable formula has been decided upon and its coefficients determined, the investigator studies the problem further by using other mathematical techniques. See CURVE TRACING; ANALYTIC GEOMETRY.

CURVE TRACING, the technique of making a graphic representation of the relationship between two correlated sets of numerical data (see CORRELATION). The simplest form of curve tracing involves the plotting of paired items of data. For example, the volume of a gas and its various correlated pressures are listed in accessible tables. When these data are plotted as points in an appropriate coordinate system (see COORDINATE) and a line is drawn with these points as guides, a curve or straight line is obtained. If a table of numerical data is not available the investigator begins with a formula or equation involving the variables (see ALGEBRA; ANALYTIC GEOMETRY). This formula may be used to calculate corresponding values of the variables, which may, if desired, be displayed in a table. Some equations are easily solved for one variable in terms of the others. The formula obtained in this manner may be used to produce pairs of numbers which can be plotted as points.

In many cases, however, the equation is not easily converted into a simple, explicit formula, and for these cases other methods are available for tracing the curve. For example, the form of the equation may reveal that the curve is symmetrical with respect to one or both of the coordinates, or axes. In an equation involving the variables x and y, such that $y^2 = x^3 - 3x^2 + 2x$, the symbol y is replaced by $-y$. The new equation then is $(-y)^2 = x^3 - 3x^2 + 2x$. However, $(-1)\ (-1)$ is equal to $+1$ and so since



This curve results from plotting with the methods of curve tracing the values for x and y in the equation $y^2 = x^3 - 3x^2 + 2x$. Note that the curve is symmetrical to the x axis and that no real values will exist in the shaded regions.

$(-y)^2 = y^2$, the new equation is equivalent to the original one. Thus the curve will be symmetrical to the x axis, since for any value of x the value of both y and $-y$ will satisfy the equation (see figure). When the part of the curve above the x axis has been drawn, the lower half can be sketched by using symmetry. If, when x is replaced by $-x$, an equivalent equation is produced, then the curve will be symmetrical to the y axis. In this example, x does not equal $-x$, and the curve is not symmetrical to the y axis. After symmetry has been determined the next step is to locate points at which the curve crosses the coordinate axes. In the example $y^2 = x^3 - 3x^2 + 2x$, when $x = 0$, then $y = 0$, and one point (0,0), is at the origin. When $y = 0$, x can have the values of 0, 1, or 2. Therefore (0,0), (1,0), and (2,0) are points on the curve. Values of x or of y that must be excluded should also be investigated. In the example, if x is a negative number then y is a complex number (see COMPLEX NUMBER). Since complex numbers cannot be represented on the ordinary Cartesian plane (see COORDINATE), negative values of x are excluded. Further investigation will show that values of x greater than 1 but less than 2 must be excluded for the same reason.

The existence of maximum or minimum points on the curve is most easily studied by finding derivatives of the equation (see MAXIMA AND MINIMA). In the example a maximum point is located at approximately the point (.42, .62), and by symmetry there is a corresponding minimum point at (.42, −.62). Calculus enables the investigator to predict that when x is greater than 2 the slope of the curve increases rapidly. See CALCULUS, *Differential Calculus*.

Even though only a few points have been calculated, an approximation to the curve may be sketched. If further refinements are necessary, calculus provides the most efficient tool for locating other points and determining the area enclosed by the curve.

M. L. HARTUNG

CURWOOD, JAMES OLIVER, 1878–1927, U.S. novelist, was born in Owosso, Mich. His tales of adventure include *Kazan* (1914), *The River's End* (1919), *The Alaskan* (1923), and *The Black Hunter* (1926).

CURZOLA. See DALMATIA; KORČULA.

CURZON LINE, the proposed boundary between Poland on the west and Lithuania and Russia on the east, as suggested by a committee headed by Lord Curzon at the Paris peace conference after World War I. The line was adopted by the supreme council of the conference, but was rejected by Poland because it would have awarded Vilna and other territory to Lithuania and considerable land to Russia. (See VILNYUS.) Polish territory between World Wars I and II actually extended well to the east of the line and south of its southern terminus. The partition of Poland between Germany and Russia in September 1939 followed the Curzon line in general. The Yalta agreement of February 1945 proposed that the Polish-Russian border follow the Curzon line with some deviations in favor of Poland, and this, with some adjustments, was the line established in 1946. See POLAND, History.

CURZON OF KEDLESTON, GEORGE NATHANIEL CURZON, 1st MARQUIS, 1859–1925, English statesman, was born in Kedleston, and educated at Balliol College, Oxford. He was in parliament, 1886–98, served as undersecretary of state for India, 1891–92, and later was viceroy and governor general of India, 1899–1905. As viceroy Curzon initiated important reforms but aroused Indian Nationalist opposition by the partition of Bengal, which seemed to favor the Moslems. He resigned when the home government supported Kitchener's proposal to divest civil authorities of control over military forces in India. He became chancellor of Oxford, 1907, was made an earl in 1911, and later became a Conservative leader in the House of Lords. During World War I, he was lord privy seal, a member of the war cabinet, and later foreign secretary under Lloyd George, Bonar Law, and Stanley Baldwin. At the Paris Peace Conference, 1919, he suggested the "Curzon Line" (see CURZON LINE) to settle the eastern Polish border question. He opposed French occupation of the Ruhr and presided over the Lausanne Conference to conclude peace with Turkey, 1923. His writings include *Problems of the Far East* (1894); and *British Government in India* (1926).

CUSA, NICHOLAS OF, real name Nikolas Chrypffs, Latinized name Nicolaus Cusanus, 1401?–64, German scholar, was born at Kues (Cusa), near Trier, of humble parentage. In 1424 he became a doctor of law at Padua and took church orders. As archdeacon of Liège he assisted the Congress of Basel, 1431–49, during which he promised a reform of the Julian calendar along Gregorian lines and assailed as invalid the Donations of Constantine and the Isidorian Decretals (see CRITICISM). In 1448 he was

Curzon Line, Famous Treaty Line Proposed as Polish Border

created a cardinal by Pope Eugene IV; two years later he was named bishop of Brixen (Bressanone), Italy, and subsequently distinguished himself as a papal legate. Traveling widely in this capacity, he corrected abuses in monasteries, sought to end the Hussite schism, mediated for Anglo-French peace, promoted a crusade against the Turks, and in many other ways showed himself to be an able diplomat. But he was more important as a scholar and thinker who broke with Scholasticism long before it became fashionable. Cusanus' most important works are *De docta ignorantia* and *De conjecturis libri duo*, both issued in 1440, in which he maintained that while all human knowledge is mere conjecture and the essence of wisdom is the recognition of human ignorance, nevertheless the reality of God can be apprehended through intuition (*intuito*, *speculatio*). For his time he was a humanist, his views approached pantheism, and he exerted a profound influence upon the thought of Bruno (see BRUNO, GIORDANO). There was hardly an aspect of the intellectual life of his time upon which Cusanus did not inform himself in a way that was to be influential later. Coupling his intellectual and spiritual endeavors with effective work in the world of affairs, he was in a sense comparable to the image of the "universal man" so popular during the Renaissance.

CUSCO. See CUZCO.

CUSCUS, a furry, slow-moving animal native to the southwest Pacific region. Related to the American opossum (see MARSUPIAL), individuals belonging to two distinct genera are commonly seen. The cuscus, genus *Phalanger*, is 15 to 30 inches in body length and has a 15-inch tail. It lives in trees and eats leaves, birds, and small mammals. Natives are fond of cuscus flesh. The spotted cuscus, genus *Spilocuscus*, displays a wide difference in color between male and female. Both sexes are dark colored, but the male's back is spotted while that of the female is unmarked. Two to four young are carried in the female's pouch.

CUSH, or Kush, a land mentioned in the Bible, perhaps deriving its name from Cush, the son of Ham. Some references apparently are to a land corresponding to part of the modern Sudan. Others seem to place Cush in eastern Mesopotamia. Possibly similar names were given to districts or regions in both areas.

CUSHING, CALEB, 1800–79, U.S. statesman, was born in Salisbury, Mass., was educated at Harvard University, and became a lawyer. As a Whig congressman, 1835–43, Cushing supported Harrison, but after the split in the party followed Tyler rather than Clay. He later became a Democrat. As U.S. commissioner to China, 1843–45, he concluded the first treaty between the United States and China, opening five ports to U.S. trade and establishing the principle of extraterritoriality for U.S. citizens. Cushing engineered the surprise nomination of Franklin Pierce for president at the 1852 Democratic convention and was later attorney general in Pierce's cabinet. During the Civil War he supported the Union and returned to the Republican party, becoming an adviser to Lincoln. Cushing was senior counsel for the United States in the Alabama claims case before the Geneva arbitration tribunal; his *Treaty of Washington* (1873) was an attack on the English counsel in the case. He also wrote *The Growth and Territorial Progress of the United States* (1829). See ALABAMA CLAIMS.

CHICAGO HIST. SOC.
Caleb Cushing

CUSHING, HARVEY WILLIAMS, 1869–1939, U.S. neurosurgeon, was born in Cleveland, Ohio, and educated at Yale and Harvard universities. He later taught at both institutions. Cushing was a pioneer in brain surgery, and much that is known about the functions of the pituitary gland is the result of his brilliant studies. During World War I Cushing rendered distinguished service as senior consultant in neurosurgery to the U.S. and British armies; he described his war experiences graphically in *From a Surgeon's Journal* (1936). Among his other works are *The Pituitary Body and Its Disorders* (1912); *Intracranial Tumors* (1932); and *Life of Sir William Osler* (1925), which won a Pulitzer prize.

CUSHING, RICHARD JAMES CARDINAL, 1895– , U.S. Roman Catholic prelate, was born in Boston, was educated at Boston College and St. John's Seminary there, and was ordained a priest in 1921. From 1921 to 1935 he held a series of pastoral assignments in the archdiocese of Boston and was active in the Society for the Propagation of the Faith. He became auxiliary bishop of Boston and titular bishop of Mela, 1939, and in 1944 succeeded William Cardinal O'Connell as archbishop of Boston. In December 1958 he was made a cardinal by Pope John XXIII.

CUSHING, WILLIAM, 1732–1810, American jurist, was born in Scituate, Mass., and was educated at Harvard University. He taught school, practiced law, was active politically, and, when the independent state government of Massachusetts was established, became justice of the state supreme court. In 1789 George Washington appointed him associate justice of the U.S. Supreme Court, a post he held until his death.

CUSHING, WILLIAM BARKER, 1842–74, U.S. naval officer, was born in Delafield, Wis., and reared in Chicago; Gallipolis, Ohio; and Fredonia, N.Y. Cushing attended the U.S. Naval Academy but was forced to resign for disciplinary reasons. He served in the Navy during the Civil War, however, carrying out several dangerous and responsible enterprises. Restored to his commission in October 1861, he became a lieutenant in July 1862 at the age of 19. Extremely active in various coastal operations, Cushing is best known for his destruction of the Confederate ram *Albemarle* on October 27, 1864, at Plymouth, N.C. Approaching in a small launch, Cushing and his crew placed a torpedo under the *Albemarle* despite heavy gunfire. Thrown into the water by the explosion that destroyed the vessel, he escaped capture. He received many awards for his heroism and was made lieutenant commander. Cushing took part in the attack on Fort Fisher and continued in naval service following the war. E. B. LONG

CUSHING, city, NE Oklahoma, Payne County; on the Santa Fe and the Missouri-Kansas-Texas railroads; 45 miles WSW of Tulsa. The area was settled in 1892, and Cushing was incorporated in 1894 and adopted the city-manager form of government in 1929. The city experienced a boom in 1912 with the discovery of oil in the area. Oil, leather goods, and meat are processed. Pop. (1950) 8414.

CUSHMAN, PAULINE, 1833–93, U.S. spy and actress, was born in New Orleans. During the Civil War she served as a secret agent for the Union side. Captured near Tullahoma, Tenn., she was sentenced to hang but was left behind in the Confederate retreat from Shelbyville, Tenn., in June 1863. Widely acclaimed for her services, she later returned to the stage and lecture platform. E. B. LONG

CUSK, a popular food fish found along the Atlantic Coast of North America from Arctic regions as far south as Cape Cod, Mass., and New Jersey. The cusk, *Brosme brosme*, a member of the cod family, *Gadidae*, differs from other members of the family in having a single long fin on its back. Other cod have two fins. Cusks range in size from 18 to 24 inches. The female is prolific, laying as many as 2 million eggs in a season. The cusk is a bottom dweller and feeds upon smaller fish, mollusks, and crustaceans.

CUSTARD APPLE, or annona, is a genus of tropical shrubs and trees belonging to the family *Annonaceae*. The plants are often cultivated for their sweet-

scented leaves and fleshy, edible fruit. Propagation is by seeds, budding, or grafting. There are about 50 species of *Annona* found in tropical and subtropical regions of America and Africa. An important American species is *A. Cherimola* (see CHERIMOYA). The soursop, *A. muricata*, which grows to a height of about 20 feet, has large, green, rough-skinned fruit with a white tart pulp. The fruit may weigh 5 pounds. The sweetsop or sugar apple, *A. squamosa*, bears yellowish oval fruit about the size of an orange, with a delicious yellow pulp. *A. reticulata*, the bullock's-heart or custard apple, bears smooth, roundish, yellow fruit about 3 to 5 inches in diameter. The pulp is soft and sweet.

CUSTER, GEORGE ARMSTRONG, 1839–76, American soldier, was born in New Rumley, Ohio, but much of his early life was spent at the home of a half sister in Monroe, Mich. He was graduated from West Point in 1861, was assigned to the Fifth Cavalry, and took part in the battle of Bull Run. Custer served on the staffs of Major Generals Philip Kearny, George B. McClellan, and Alfred Pleasanton, was promoted from captain to brigadier general after leading a charge at Aldie, and led the Michigan Brigade at Gettysburg. A major general of volunteers at the age of 23, he commanded a division of cavalry under Maj. Gen. Philip H. Sheridan at Woodstock, Cedar Creek, and Five Forks; and received the flag of truce for Gen. Robert E. Lee's surrender at Appomattox. Throughout the Civil War the "Boy General" was noted for his dash and courage, and for his flashy uniforms; a red handkerchief worn around the neck identified the men of his brigade.

CHICAGO HIST. SOC.

Gen. George Custer

In 1866, after service with his division in Texas, Custer was named lieutenant colonel of the new Seventh Cavalry (retaining the brevet rank of major general). He led the Seventh in Maj. Gen. Winfield Scott Hancock's expedition against the Indians in 1867 and in 1868 was sent by Sheridan against the Cheyennes, destroying Black Kettle's village on the Washita, November 26. He wrote about this period in *My Life on the Plains* (1874). There followed General D. S. Stanley's Yellowstone expedition (1873) and Custer's Black Hills expedition (1874).

In 1876 the Seventh Cavalry formed part of Maj. Gen. Alfred H. Terry's column which, with columns led by Maj. Generals John Gibbon and George Crook, was sent against the Sioux led by Sitting Bull and Crazy Horse. Custer's five detached companies met the main body of the Sioux on the Little Big Horn, in Montana, June 25, and were killed to the last man. The remaining seven companies of the regiment, under Maj. Marcus L. Reno and Capt. Frederick W. Benteen, defended themselves until Terry and Gibbon arrived.

Custer was married in 1864 to Elizabeth Bacon (1844–1933), whose books, *Boots and Saddles* (1885), *Tenting on the Plains* (1887), and *Following the Guidon* (1890) are sources on the period. DON RUSSELL

CUSTER, city, SW South Dakota, county seat of Custer County; in the S Black Hills; on the Burlington Railroad, U.S. highways 16 and 85A; 30 miles SW of Rapid City. It was here in 1874 that gold was first discovered in the Black Hills. The town was laid out the following year. Custer is in a resort area at an elevation of 5301 feet. Mica, feldspar, beryl, rose quartz, and lithium ores are mined in the area. Points of interest nearby are Custer State Park, Mount Rushmore National Memorial, Harney Peak (7242 feet), and a state tuberculosis sanitarium. Pop. (1950) 2017.

CUSTER BATTLEFIELD NATIONAL MONUMENT, SE Montana, 55 miles ESE of Billings near Crow Agency. The 765-acre area is the site of the Battle of the Little Big Horn River, June 25, 1876, in which Gen. George A. Custer and his command were annihilated by the Sioux and North Cheyenne Indians. The area was proclaimed a national cemetery by Pres. Grover Cleveland, Dec. 7, 1886, and remained under the administration of the War Department until July 1, 1940, when it was transferred to the National Park Service. Its present name was adopted Mar. 22, 1946. See LITTLE BIG HORN BATTLE.

CUSTIS, GEORGE WASHINGTON PARKE, 1781–1857, U.S. writer, was born in Mount Airy, Md. He was the adopted son of George Washington, and the grandson of Martha Washington by her first marriage. He published several plays but is remembered chiefly for his *Recollections and Private Memoirs of Washington* (published with a memoir of the author by his daughter, 1860), in which appear many traditional but unverifiable stories about Washington.

CUSTIS-LEE MANSION NATIONAL MEMORIAL. See ARLINGTON NATIONAL CEMETERY.

CUSTOM, all rules of law not directly derived from acts of the legislature; custom also denotes a popular usage which under certain conditions may be a source of law. When an American or English court decides in accordance with a usage it holds, in effect, that the usage is actually law, the requisite conditions having been fulfilled. The question as to whether these conditions have actually been fulfilled comes then to be merely one of fact.

The conditions generally required by the American and English courts in order that a custom may have legal force are that it must be: (1) of long standing; (2) uninterrupted, that is, not upheld at one time and repudiated at another; (3) regarded as mandatory, not optional; (4) reasonable; and (5) not contrary to any recognized rule of law. Probably the best judicial statement ever made about custom was that by Judge Benjamin N. Cardozo of the New York Court of Appeals in *Manhattan Company* v. *Morgan*, in 1926. Judge Cardozo declared: "We do not underrate the importance of permitting business to originate for itself the methods and instrumentalities that may be found by experience to be helpful to its free development. There is force in the argument that wider freedom of choice through the spontaneous flowerings of custom would work a social gain. One of the debit items to be charged against codifying statutes is the possibility of interference with evolutionary growth. It is the ancient conflict between flexibility and certainty."

Social Custom. A pattern of conduct that is generally accepted and passed on by tradition or other means of education is a social custom. A social custom may be a simple act, such as applauding by clapping the hands, or a whole complex of actions, such as those governing barter and exchange between two tribes. Social customs are derived from usage and have arisen to meet some problem, need, or situation. A people's customs reflect the culture of the group. See FOLKWAYS; RITE; SOCIOLOGY.

CUSTOMHOUSE, an office established by law in a port of entry for the collection of customs, duties, and import taxes, and for the documentation, entry, and clearance of vessels. In the United States customhouses are within the jurisdiction of the U.S. Bureau of Customs under the commissioner of customs, to whom authority over the Customs Service has been delegated by the secretary of the treasury. The Department of Justice is responsible for reappraisement and classification of imported goods.

Each customhouse is administered by a collector of customs, appointed for a four-year term by the president with the approval of the senate. The duties of a collector of customs are to receive the entries of all vessels, and of the goods imported in them, and to assess and collect the duties payable thereupon under

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Declared through customs were these antique pistols from England, packed in a cavity cut through pages of a heavy Bible. Inspectors must be on the alert for smuggling.

the law. Together with the enforcement of the custom laws and regulations, the collector of customs administers certain laws relating to navigation, the documentation of vessels, and immigration.

CUSTOMS, the agency through which a government collects a tariff or tax on foreign goods brought into a state, or domestic goods sent abroad. The term refers to the tax collected, *customs duties*, and in general to the entire system of procedures involved in collecting the tax. Customs duties increase revenue and protect domestic industry from foreign competition and are imposed according to detailed duty schedules and regulations fixed by law.

United States customs regulations stipulate that all residents, upon re-entering the country from abroad must declare all articles obtained abroad, whether by purchase or otherwise. To qualify for exemption, such goods not accompanying the person must also be declared at the time of re-entry.

All wearing apparel and personal and household effects taken out of the United States by returning residents are admitted free of duty, without regard to their value, upon establishment of their identity. If, however, they have been remodeled, repaired, or otherwise improved in condition abroad, the cost of such remodeling, repairing, or improvement is subject to duty. The exemption may be applied to the dutiable cost of repairs.

In general, if the United States resident has been abroad for at least 12 days, he is allowed a total exemption of $500 in value of articles he has purchased or otherwise acquired abroad for personal use. This is actually two exemptions, the first for $200, and an additional one for $300. Each member of a family is entitled to an exemption and the exemptions may be pooled.

The $200 exemption is applied first and covers all articles acquired abroad (including distilled spirits, wines, and malt liquors aggregating not more than one wine gallon and not more than 100 cigars), which were purchased for personal or household use or as souvenirs or curios, but not bought on commission or intended for resale. A resident is not entitled to this exemption if he has been outside the United States for less than 48 hours (except for travel to Mexico where no minimum stay is required) or if he has had a previous exemption in the past 30 days.

If the resident has been abroad at least 12 days, he may receive an additional exemption of $300. This exemption does not apply to liquors or cigars. The resident must also not have received this second exemption during the past six months.

Nonresidents of the United States may bring in free of duty articles of apparel, toilet articles, and similar personal effects, if such items were owned by them at the time of their departure abroad. All articles, however, must be declared. Nonresidents may bring in, duty free, 50 cigars, or 300 cigarettes, or 3 pounds of tobacco and not over one quart of alcoholic beverages, if these are not intended for sale or other commercial use.

Household effects brought in as baggage by returning residents or nonresidents must be declared; but if shown to the satisfaction of the customs officer to have been actually used abroad by them not less than one year, and not intended for any other person or for resale, such effects will be admitted free of duty.

Customs inspectors are located in seaport cities, cities with airports receiving international flights, and at many entry points along the Canadian and Mexican borders. Generally, declarations are made on written forms provided aboard ship or other transportation. Residents returning from Canada or Mexico who have not more than $25 worth of articles acquired for personal use may make oral declarations.

When the baggage has been examined, and the values fixed by an appraising officer, the duties and taxes, if any, are collected from the passenger before the baggage is released. Passengers dissatisfied with the assessment of duty on their baggage may demand a re-examination, provided the articles have not been removed from customs custody. If reappraisement by the U.S. Customs Court is desired, the passenger must make application to the collector of customs in writing within 30 days after the original appraisement.

Customs regulations of Canada are similar to those of the United States. However, returning residents of Canada are entitled to $100 worth of exemptions for articles intended for personal use, and not bought on commission, as an accommodation for other persons, or for sale, provided the resident has been absent from Canada for at least 48 hours. Exemptions may be granted only at four-month intervals, and are limited to baggage actually accompanying the returning resident. A limit of one quart of alcoholic beverage, 50 cigars, 200 cigarettes, or two pounds of manufactured tobacco is applied. Exemptions of articles of more than $5 in value must be claimed in writing.

CUSTOMS, U.S. BUREAU OF, a bureau in the Department of the Treasury charged with the functions of assessing and collecting import duties; the prevention of smuggling including the smuggling of contraband, such as narcotics; and the execution of the preventive, sanitary, and other laws governing imports and exports.

Under the Executive Order of Feb. 28, 1942, the bureau also regulates certain marine activities, such as the registry, enrollment, licensing and admeasurement of vessels; the collection of tonnage taxes and the supervising of the entrance and clearance of vessels and aircraft; the regulation of vessels in the coasting and fishing trades; the regulation of the use

Customs men give quarters of an Indian crew on a British ship a rigid inspection. Port patrol officer at left is questioning a crew member about a can of native cigarettes.

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of foreign vessels in the territorial waters of the United States; the recording of mortgages and sales of vessels; the protection of steerage passengers; and the remission and mitigation of fines, penalties, and forfeitures incurred under the laws governing these matters.

In connection with the government export control program, the bureau is charged with the inspection of all export declarations and permits in compliance with the licensing provisions of the State Department, the Bureau of Narcotics, the Bureau of Foreign Commerce, the Atomic Energy Commission, and other government agencies to prevent the unauthorized exportation of controlled materials. On behalf of the State Department, the bureau examines the passports of American citizens departing from the United States for certain countries, and also supervises the search of the persons and baggage of suspects entering the United States to prevent the entry of gold into this country in violation of the Gold Reserve Act of 1934.

The U.S. Bureau of Customs was created by an act of Congress on March 3, 1927 out of the old customs division of the Department of the Treasury. It is supervised by the commissioner of customs, who is in charge of 51 district offices located strategically throughout the states and territories of the United States. See Blockade; Contraband of War.

CUSTOMS AND PATENT APPEALS, U.S. COURT OF, a specialized appellate court created in 1910 to review decisions of the Customs Court, both as to the law and the facts concerning classifications and duties upon imported merchandise, the legal questions in the findings of the Tariff Commission as to unfair practices in import trade, and all appealable questions as to the customs laws and regulations. In 1929 the Court was given jurisdiction to review decisions of the Patent Office on applications and interferences as to patents and trade-marks. The court consists of a chief judge and four associate judges, who sit *en banc*, or as a body; the other officers of the court are a clerk, a marshal, a reporter, and their assistants. Appeals, especially in cases involving constitutional questions and treaty interpretation, may be taken to the Supreme Court. See Patent.

CUSTOMS COURT, U.S., a federal court of special jurisdiction. It was created in 1890 as the Board of U.S. General Appraisers; the name was changed in 1926 to the present one. The court has sole jurisdiction over actions arising under the tariff laws as to the construction of the law and the facts respecting the classification of merchandise and the rate of duty imposed thereon under such classification, and the fees and charges connected therewith, together with the determination of the dutiable value of imported merchandise. It also has sole jurisdiction in proceedings for relief from increased duties occasioned by the action of appraisers in advancing values. The court has a presiding judge and eight judges; its sessions are held in New York City.

CUSTOMS UNION, a commercial league entered into by independent territories, states, or nations to extend free trade within their joint boundaries and to adopt a common tariff policy toward other countries. The most conspicuous example is the *Zollverein*, organized among the German states by treaty in 1833. Before this treaty the separate customs systems of the 60 German states had hampered their trade and economic development. Spurred by the demands of manufacturers and the arguments of Georg Friedrich List, a series of separate treaties led to the formation of the *Zollverein* which became effective on Jan. 1, 1834. Although its effectiveness was handicapped by the requirement of a unanimous vote by the states on tariff matters, it was a significant step toward the formation of the German Empire in 1871. Other customs unions of lesser importance were formed in the late nineteenth and early twentieth centuries, notably the union among several South African territories six years before the creation of the Union of South Africa in 1909. In April 1947 a customs union was established among the so-called Benelux countries—Belgium, the Netherlands and Luxembourg.

CUSTOZZA or **CUSTOZA,** village, N Italy, 11 miles SW of Verona. Near Custozza were fought two important battles. On July 24, 1848, Prince Radetsky and an Austrian army defeated the Sardinian troops. On June 24, 1866, the Italians were defeated by Austrian troops under the Archduke Albert.

CÜSTRIN. See Küstrin.

CUT-AND-COVER, a method of tunnel construction used where it is possible to work from the surface. A trench is dug with excavating machinery, and the tunnel's floor, walls, and roof are constructed in the trench. Earth is then replaced around and over the structure to finish the project. Many subway tunnels are built by the cut-and-cover method. See Subway; Tunnel.

CUT BANK, town, NW Montana, county seat of Glacier County; on Cut Bank Creek, the Great Northern Railroad, and U.S. Highway 2; a scheduled airline stop; 90 miles NW of Great Falls. The area was settled in 1890, and the town was incorporated in 1911. Cut Bank derived its name from a stream that was described by the Blackfeet Indians as "the river that cuts into the white clay banks." The town is in the center of an oil and gas field and a ranching area. Pop. (1950) 3721.

CUTCH or **KUTCH,** also Kachh, state, W India; bounded on the N and NW by Pakistan, on the E by the state of Bombay, on the S by the state of Saurashtra and the Gulf of Cutch, and on the SW by the Arabian Sea; area 8461 sq. mi.; pop. (1951) 567,606. The capital is Bhuj. The area is treeless and barren except along the southern coast line, where there are low rocky hills. In the north is the Rann of Cutch, a salt marsh. The agricultural economy is semi-pastoral; small amounts of wheat, barley, and cotton are grown, and a few cattle are kept. Fishing is a chief occupation along the coast. Silver work and embroidery are the principal handicrafts. After the thirteenth century the area was under the Rajput nobles. In 1948 it was made a state and administered by a chief commissioner.

CUTCH. See Catechu.

CUTCH, RANN OF, a salt marsh, W India, in the N part of the state of Cutch and the SW part of the state of Sind, Pakistan. The area was originally an arm of the Arabian Sea. After deposition took place it was inundated only during the monsoon period and became a mud flat in the dry season. During the dry period it is worked for salt.

CUTHBERT, SAINT, 635?–687, Celtic monk, was probably born in Northumberland. He joined the Old Melrose monastery and became a prior there, but desiring a more severe life went into seclusion on the Farne Islands where he reputedly performed miracles. He was induced to become bishop of Lindisfarne but retired again to his island hermitage, where he died. In 1104, his body was placed in a shrine at Durham Cathedral, which was a center of pilgrimage until destroyed during the Reformation. One of the strictest of ascetics, Cuthbert fulfilled the ideal of clerical piety and became one of England's saints. His feast day is March 20.

CUTLASS or **CUTLAS,** a short, heavy sword with a flat, wide, slightly curved blade, better adapted for cutting than for thrusting. It found its greatest use in sailing days, when ships were maneuvered so as to be grappled together and boarded for hand-to-hand fighting. In the U.S. Navy the Model 1860 cutlass was little used as a weapon in the Civil War, but was retained for ceremonial use; the Model 1917 cutlass was used until World War II. The cutlass was restored for parade use in some organizations in 1951.

CUTLER, MANASSEH, 1742–1823, U.S. clergyman, was born in Killingly, Conn., and was graduated from Yale in 1765. Following his admission to the Massachusetts bar, he taught school, and during the

Revolutionary War was chaplain of a Massachusetts regiment. In 1787, as an agent for the second Ohio company, he took a conspicuous part in bringing about the organization and settlement of the Northwest Territory. He took part in the drafting of the famous Ordinance of 1787—some writers credit him with being the principal author of that document—and was one of the founders of Marietta, Ohio, in 1788. As a Federalist he was a member of the House of Representatives, 1801–05. In addition to his other activities, he was a physician, a botanist, and an astronomer.

CUTLERY, hand implements used for cutting; in a more general sense knives, forks, and spoons. Two general types of cutlery are recognized in the trade: *domestic*, which includes table utensils, pocketknives, scissors, and razors; and *tool*, which includes butcher knives, cleavers, and surgical instruments.

History. The first cutlery probably consisted simply of sharp stones and shells picked up by primitive man; later he discovered how to make cutting implements by shaping bone, wood, and stone (see FLINT). The metals copper, bronze, iron, and, finally, steel were used as man came to understand the working of these metals. A still later development in cutlery materials was the introduction of stainless steel in 1914. Early metal cutlery was cast or forged by hand and sharpened on hand grindstones; machinery for performing these operations began to be introduced in the nineteenth century. By the mid-twentieth century most cutlery in industrialized nations was machine made, although hand forged blades were still available in the best quality cutlery.

Through medieval times cutlery in Europe consisted mainly of weapons (see KNIFE; SWORD). Daggers, worn by most men, were used for cutting meat at the table as well as for fighting. Table knives appeared toward the close of the fifteenth century as conditions became more settled. Folding pocketknives also appeared, although the type with springs to hold the blades open or closed was not developed until about 1850. Steel was by far the best material for cutlery, but it was scarce and expensive until perfection of the Bessemer process about 1860. Consequently it was a noteworthy advance when an early American manufacturer welded steel scissor blades to cast-iron handles to produce a low-priced product with a good cutting edge.

Manufacture of cutlery in western Europe tended to develop in certain towns. The industry was important in Paris as early as 1261; other ancient centers of the trade in France were Thiers, Langres, and Nogent. Toledo, Spain, was famous for its fine swords, and the Italian cities of Florence, Rome, and Milan also developed cutlery industries. Solingen has long been the center of German cutlery production and Sheffield, England, has been famous for fine cutlery since the fourteenth century.

Most cutlery used in the American colonies and in the United States up to the middle of the nineteenth century was imported from England. The John Russell Company, established in Massachusetts in 1834, was one of the first domestic manufacturers, followed by the Meriden Cutlery Company of Meriden, Conn., in 1835. Cutlery made in the United States usually resembled the Sheffield products. In fact, many Sheffield craftsmen were brought over to work in the new American factories, but U.S. manufacturers adopted machine production much faster than did Europeans. Centers of production in the United States pushed westward as the country expanded.

Manufacturing Processes. The materials used for most high-quality blades are alloy steel, generally of the stainless type, and carbon steel. Stainless steels are especially suitable for kitchen knives, pocket knives, and surgical and dental instruments. In hand manufacture, a blademaker cuts a piece from a heated bar and hammers it into rough blade shape with a projection (called a tang) at one end. By alternate heating and hammering he forges it to the size and shape desired and then hardens and tempers it. The blade then goes to a grinder, who smooths and sharpens it on a grindstone. Another worker puts a handle on the tang. The blade then is polished and finally whetted on an oilstone to produce a fine edge. Similar operations produce handmade scissors and other cutlery.

Machine operations follow similar sequences; mechanical hammers forge the blades, automatic furnaces harden and temper them, and special machines grind them. The cheaper blades are not forged but are simply punched from sheet metal. Assembling scissors and placing handles on knives constitute the major handwork.

Most table cutlery is made from sterling silver, silver-plated steel, or stainless steel. The metals are often used in combination, as when steel blades are fitted into silver handles. O. A. N.

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CUTTACK, city, E India, in the state of Orissa; at the apex of the delta of the Mahanadi River; 200 miles SW of Calcutta. The city is a trade center for lac, rice, timber, oilseeds, and hides. Rubber stamps, brassware, flour, leather products, textiles, and gold and silver filigree are manufactured in Cuttack. Several liberal arts colleges and a medical school are located here. The city was formerly the capital of the state. Pop. (1951) 102,505.

CUTTER, a small vessel with a single mast, rigged fore and aft with a mainsail, a forestaysail, and a jib set to bowsprit end; also a broad, square-sterned boat used by warships for carrying passengers and stores. In the United States sloop yachts of deep draft and comparatively small beam are generally called cutters. Patrol vessels of the U.S. Coast Guard are officially called cutters, after the armed cutters first employed in 1791 by the revenue marine and the designation U.S. Revenue Cutter Service, which was employed until that service was absorbed by the Coast Guard in 1915. See COAST GUARD, U.S.

CUTTING, any portion of a plant that has been removed for purposes of propagation and which will form new roots and buds when planted under suitable conditions. The cutting itself may be a stem, branch, leaf, or root. The parts cut are placed in water, soil, sand, peat moss, or any other medium that will induce root growth. This method of propagation serves to reproduce plants identical with the parent plant, to perpetuate plants that do not form seeds, and to insure protective size and vigor early in the life of the new plant.

Many cuttings can take root and form new parts because of special embryonic or meristematic cells which are actively concerned with plant growth (see

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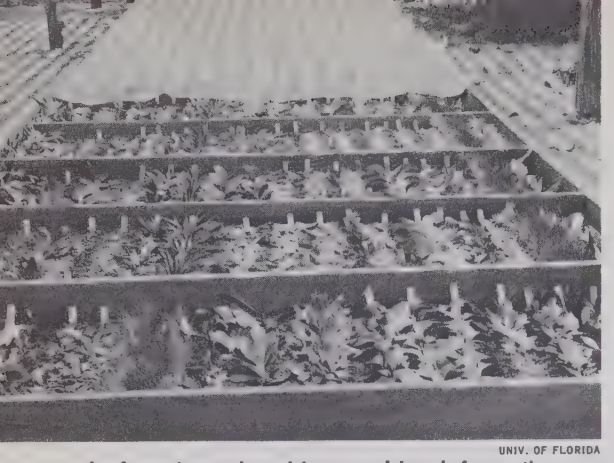
Stem cuttings are prepared for the cutting bed by removing all but a few of the topmost leaves, which in many cases are cut in half or in smaller pieces to reduce the surface.



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Leafy cuttings, planted in ground bench for rooting, are kept in half shade to prevent burning and retain moisture. Cloth protects some of the cuttings from direct sunlight.

PLANT STRUCTURE, Tissues, *Embryonic or Meristematic Tissues*). Such cells are found in buds and are responsible for the development of new stems and leaves from the bud, whether it remains attached to the parent plant or is removed as part of a cutting. Stem cuttings usually include several buds. In making stem cuttings, the cut is made a short distance below a node. Roots arise from the lower end, not from embryonic cells but by division of older cells within the stem or from the cells of the callus that forms over the cut surface. Some plants, however, have the rudiments of roots already formed within their stems. Root formation sometimes may be induced before a cutting is made if wet moss is fastened around the stem base. Root development may be stimulated by soaking the cutting in certain organic substances related to hormones naturally produced by plants. Stem cuttings are classified as softwood or hardwood, depending on whether they are made from soft growing shoots, like those of the geranium, or from dormant woody branches. Some leaf cuttings depend on a reactivation of mature cells for growth because they lack embryonic cells. Other leaves possess within themselves the complete embryonic structures necessary to form stems, leaves, and roots. Plants of the genus *Bryophyllum*, for example, will sprout complete new young plants in the notches of their leaves when the leaves are cut from the plant and kept in a warm, moist place. Root cuttings are used for the propagation of woody plants, such as the blackberry, that form shoots readily from their roots. Tuberous roots are sometimes cut but that portion bearing a bud must be used.

OREGON STATE COLLEGE

Bryophyllum leaf with new plants formed at notches of the old leaf.

CUTTING, FLAME. See FLAME CUTTING.

CUTTLEFISH, a free-swimming marine invertebrate found in waters off the southern coast of Europe (see CEPHALOPODA; MOLLUSCA). The cuttlefish, genus *Sepia*, has an internal shell, or cuttlebone, that is used to provide lime in the diet of cage birds and also as a polishing agent. The cylindrical body is covered by a highly muscular mantle which is eaten by people in the countries bordering the Mediterranean Sea. Cuttlefish are about 20 cm long and are brownish with white spots or stripes; the fins are violet. See SEPIA.

CUTTYHUNK. See ELIZABETH ISLANDS.

CUTUCO. See LA UNIÓN.

CUTWORM, a destructive caterpillar of various moths belonging to the family *Noctuidae* (see BUTTERFLY AND MOTH; CATERPILLAR). Cutworms hibernate underground during the winter and emerge during the spring to feed on stems of grain plants and vegetables. Some species are known to climb trees and destroy the buds. Various poisoned baits are effective in combating these pests.

CUVIER, GEORGES LÉOPOLD CHRETIEN FRÉDÉRIC DAGOBERT, BARON, 1769–1832, French naturalist, was born in Montbéliard. He attended the Stuttgart Academy and at the age of 18 became a tutor in Fécamp, near Caen, where he became interested in the animals and fossils of sea and shore. There he made the acquaintance of the naturalist A. H. Tessier who, impressed with Cuvier's observations, recommended him to Geoffroy Saint-Hilaire. The latter invited Cuvier to Paris in 1794 and secured for him the post of assistant to the professor of comparative anatomy at the Muséum d'Histoire Naturelle. Cuvier was elected a member of the Academy of Sciences in the following year, and in 1798 published his first separate work, *Tableau élémentaire de l'histoire naturelle des animaux*, in which he first stated his natural classification of the animal kingdom. In 1800 there appeared *Leçons d'anatomie comparée*, in which he classified various organs of the body according to structure rather than function. His work came to the attention of Napoleon I, who appointed him inspector of education in 1802 and councilor of state in 1814; in these capacities Cuvier did much to improve and extend public education in France. Cuvier's career, which had survived monarchy, revolution, republicanism, and dictatorship, continued unaffected with the restoration of the Bourbons, and in 1819 Louis XVIII appointed him chancellor of the University of Paris, where he continued his investigations in zoology and paleontology. In *Le Règne animal distribué d'après son organisation* (1816–29), a 20-volume work which became a classic and was for a long period the standard text in zoology, Cuvier embodied the results of all of his past research on the structure of living and fossil animals, and was the first to classify the species of the animal kingdom according to structural, or morphological, types. In recognition of his invaluable contributions to science Cuvier was created a baron by Louis Philippe, was elected one of the immortals of the French Academy, and became a grand officer of the Legion of Honour. See CLASSIFICATION OF LIVING THINGS.

CUXHAVEN or **KUXHAVEN,** city, NW Germany, in the West German state of Lower Saxony; a port at the mouth of the Elbe River estuary; 60 miles WNW of Hamburg. Cuxhaven is a rail terminus and fishing center; some ships are built here. Industry includes the fabricating of nets, barrels, and machinery, and the processing of fish. Cuxhaven was acquired by Hamburg as a port in 1394. The town was incorporated with the town of Döse and chartered in 1907. The port was heavily damaged during World War II. Pop. (1953) 45,300.

CUYABA. See CUIABÁ.

CUYAHOGA FALLS, city, NE Ohio, in Summit County; on the Cuyahoga River and the Baltimore and Ohio and the Pennsylvania railroads; adjoining Akron on the NE as a suburb. Industrial products include machinery, tools, and plastics. Here the Cuyahoga River has a fall of about 218 feet in one-half mile. Pop. (1950) 29,195.

CUYAPO, town, Philippine Islands, in central Luzon, in the province of Nueva Ecija; 83 miles NNW of Manila. Cuyapo is a railway center in a rice, tobacco, manila hemp, and corn producing region. Pop. 28,923.

CUYO ISLANDS, a group of 47 islands in the Philippine Islands, in the province of Palawan, situated in the N part of the Sulu Sea, midway between the N end of Palawan and Panay; area

63 sq. mi.; pop. 22,445. The majority of the islands are of volcanic origin, including the largest, Cuyo Island. Other islands include Agutaya, Quiniluban, and Manamoc. The chief industries are the trading and processing of coconuts and rice. The port of the islands is the town of Cuyo, situated on the west shore of Cuyo Island.

CUYP, ALBERT, 1620–91, Dutch painter, was born at Dordrecht and studied art under his father, Jakob Gerritsz Cuyp (1575–1649), a painter of realistic pastorals and portraits. Known for his solidly composed figures against sunlit skies, Albert Cuyp is often called "the Dutch Claude Lorrain." Among his paintings are *Mussel-Eater*, *Dapple-gray Horses*, *Moonlight on the Sea*, and *Piper with Cows*.

CUYUNA RANGE, an iron-ore mining range, central Minnesota, in Crow Wing and Aitkin counties, extending along the Mississippi River in a NE-SW direction from Aitkin to Brainerd. The manganiferous ore is recovered by open-pit mining. It was first shipped from the Cuyuna Range in 1911. The chief mining center is Crosby.

CUZCO or **CUSCO,** department, S Peru, in the highlands, bounded by the departments of Loreto on the N, Madre Dios on the E, Puno on the SE, Arequipa on the S, Apurímac on the SW, Ayacucho and Junín on the W, and Pasco on the NW; area 55,731 sq. mi.; pop. (1948 est.) 649,643; (1950 est.) 672,000. The department is drained by the Apurímac and the Urubamba rivers. Agriculture is the principal industry, the chief products being coffee, sugar, coca, wheat, corn, potatoes, and beans. Livestock raising is largely confined to llamas, sheep, and alpacas. There is a wealth of mineral deposits in the surrounding region, including gold, coal, iron, and copper. Cuzco, a former capital of the Inca empire, is the capital and chief city. The department contains many Incan ruins, especially at Cuzco and Machu Picchu.

CUZCO or **CUSCO,** city, S Peru, capital of the department of Cuzco, situated in a highland valley, 360 miles SE of Lima. The city is built on the ruins of the ancient Incan city, founded in the eleventh century, that served as the capital of the Inca empire until it was virtually destroyed by Francisco Pizarro in 1533 (see PIZARRO, FRANCISCO). Much Incan stonework can be seen in the modern streets and buildings. In a few cases the ancient narrow Incan streets, such as the Callejón Loreto, remain for the most part intact. In the heart of the city is the Plaza de Armas, a sacred square of the Incas. Nearby is the seventeenth century cathedral built on the site of the Incan Temple of Virococha. The church and convent of Santo Domingo is built on the walls of the Temple of the Sun. Nearby are the Incan ruins of the House of the Chosen Women of the Sun. The church of La Compañía de Jesús, the most beautiful church in Cuzco, is built on the site of the Temple of the Serpents. The church of La Merced has become famous for its jeweled *custodia*, or shrine. Other noted churches are San Francisco, San Blas, Santa Ana, and Belén de los Reyes. In 1950 an earthquake severely damaged many of the churches and dwellings. North of the city stands the ruined fortress of Sacsahuamán, the Incan stronghold. Parts of the ruins of the Incan temples of Thunder and Lightning, and the Rainbow and the wall that surrounded the city are standing. The temples of the Stars and of the Moon are almost intact.

After Francisco Pizarro invaded the city in 1533, he converted many of the Incan buildings into private homes, erected churches on Incan foundations, and laid out a new street pattern. Shortly after the conquest of the city, the population dropped from about 200,000 to 20,000 because of disease and exploitation. The population is now predominantly Indian. Because of its archaeological sites the city is a tourist center. Cuzco is a communications, transportation, and trading center for the surrounding area, which produces wool, hides, cacao, and gold. Chief industries include tanneries and the manufacture of textiles, leather goods, soap, and chocolate. The city is the site of the National University of Cuzco, founded in 1597 as the Royal College of San Antonio the Great. (See ARCHAEOLOGY, South America; INCA; PERU.) Pop. (1948 est.) 53,242; (1950 est.) 56,000.

CYANAMIDE, a white crystalline solid that melts at temperatures from 45° to 46°C. The compound has a formula of $CNNH_2$ and dissolves readily in water, alcohol, and ether. Cyanamide may be prepared by reacting chloride gas with ammonia dissolved in ether as shown: $2NH_3 + CNCl \rightarrow CNNH_2 + NH_4Cl$. It is reduced to ammonia and methylamine by treatment with nascent hydrogen. Cyanamide is used in preparing urea, H_2NCONH_2, which is formed by the partial hydrolysis of cyanamide: $CNNH_2 + H_2O \rightarrow NH_2CONH_2$. Free cyanamide is difficult to keep in the pure state, since it is converted into the dicyanodiamide in the presence of moisture. Calcium cyanamide, $CaCN_2$, is a commercial nitrogenous fertilizer. It is also used as a weed killer and insecticide and for defoliation of cotton plants. In a crude powdered form, which contains about 60 per cent $CaCN_2$, it is sold under the name Cyanamid. Calcium cyanamide is also used for the manufacture of synthetic resins, sulfa drugs, and nitroguanidine, a smokeless propellant. Synthetic fibers, such as Orlon, are made from acrylonitrile, which in turn is made from calcium cyanamide.

Cuzco was virtually destroyed in 1533 during its conquest by Pizarro, yet parts of the city still have the narrow streets and solid stonework typical during the Incan era.

DEPT. OF THE INTERIOR, PERU

Overlooking Cuzco from an elevation on the city's northern outskirts, the massive stonework of ancient Sacsahuamán fort has remained virtually intact since pre-Incan days.

DEPT. OF THE INTERIOR, PERU

CYANAMIDE PROCESS. See AMMONIA, *Synthesis.*

CYANEAE RUPES, the Cyanean rocks, two legendary moving rocky islets in the Black Sea, near the mouth of the Bosporus. Also called the Symplegades, or clashing rocks, they were said to strike together and crush boats caught between them. The Argonauts passed them safely in their quest for the Golden Fleece. The *planctae*, or wandering rocks, mentioned in the *Odyssey* were similar.

CYANIC ACID, a compound, HCNO, that spontaneously polymerizes (see POLYMERIZATION) into cyamelide and cyanuric acid. An unstable liquid, it has an odor similar to acetic acid and a boiling point of 23.6°C. Its ammonium salt, NH_4CNO, produces urea when heated. This reaction, discovered by Wöhler in 1828, produced the first evidence that an organic compound could be prepared from organic sources. See WÖHLER, FRIEDRICH.

CYANIDE, a salt of hydrocyanic acid. Because they are chemically similar to the halogens, cyanides are frequently called pseudohalogens. (See HYDROCYANIC ACID; HALOGEN.) The more important cyanides are potassium cyanide, KCN; sodium cyanide, NaCN; and calcium cyanide, $Ca(CN)_2$. These compounds hydrolyze in water to give hydrogen cyanide and a basic solution:

$$\overset{+}{Na}\overset{-}{CN} + H_2O \rightarrow H\overset{+}{C}N + \overset{+}{Na}\overset{-}{OH}.$$

A solution of sodium cyanide will dissolve metallic silver to form a soluble compound called sodium dicyanoargentate (I) (sodium silver cyanide), $NaAg(CN)_2$. (See SILVER, *Extraction.*) A similar compound, sodium dicyanoaurate (I) (sodium gold cyanide), $NaAu(CN)_2$, is also formed by the action of sodium cyanide on gold. Solutions of complex cyanides are used as electrolytes in many electroplating processes (see ELECTROPLATING). Potassium hexacyanoferrate (III) (potassium ferricyanide), $K_3Fe(CN)_6$, illustrates the ability of the cyanide ion (see ION) to form a stable complex ion with many metallic ions. A solution of these compounds shows virtually none of the properties of the iron or cyanide ions, and consists mainly of K^+, potassium, and $Fe(CN)_6\equiv$, ferricyanide, ions. (See IRON.) The surface of iron or steel may be hardened to withstand wear and resist corrosion by treating the metal with sodium cyanide and heating to a high temperature (see CASEHARDENING). Most cyanide compounds are extremely poisonous; a concentration of cyanide greater than five parts per million can cause death. See POISON.

CYANIDE PROCESS. See GOLD, *Cyanide Process.*

CYANIDING. See CASEHARDENING.

CYANITE, or kyanite, an aluminum silicate, usually found in metamorphic rocks (see ROCK, Metamorphic Rocks). It crystallizes in the triclinic system (see CRYSTALLOGRAPHY), usually in tubular crystals or in aggregates of flattened blades. Its specific gravity ranges from 3.56 to 3.66. Its hardness parallel to the long axis of the crystals is 5; at right angles to this direction its hardness is 7 (see HARDNESS). Its color is usually blue but sometimes white, gray, or green. The luster is vitreous to pearly. Cyanite will expand on heating. It is used in the manufacture of ceramics (see CERAMICS) because the expansion of cyanite will offset the shrinkage of the clays. The mineral is found in the metamorphic rocks of Georgia, New Mexico, Arizona, Wyoming, Virginia, North Carolina, and Connecticut, and India and British East Africa.

CYANOGEN, a colorless, poisonous gas having an odor resembling that of bitter almonds; its formula is $(CN)_2$. Cyanogen is related to the cyanides and may be prepared by heating mercuric cyanide. Distillation of coal produces small amounts of cyanogen. This gas liquefies at −4°F and becomes crystalline at −30°F. Cyanogen serves as the starting material for the production of organic compounds useful as insecticides.

CYANOSIS is a condition in which the skin and mucous membranes have a bluish appearance as the result of reduced amounts of oxygen in the hemoglobin of the superficial capillaries. (See BLOOD; ARTERIES, VEINS, AND CAPILLARIES.) Because it carries less oxygen, venous blood normally is darker than arterial blood; hence, veins near the body surface, in the region of the wrist for example, give the skin a bluish cast. Most of the skin has a pinkish cast, because there are more superficial arteries than veins. See CIRCULATION OF THE BLOOD.

Any condition which interferes with oxygenation of arterial blood produces cyanosis: (1) insufficient intake of air; (2) defects in the heart or pulmonary artery, disturbing the circulation of the blood through the lungs; (3) an increase in the number of red blood cells, preventing full saturation with oxygen; (4) anemia in which there is a low level of hemoglobin, the substance with which the oxygen must combine for transportation; and (5) slow circulation of the blood.

CYAXARES, 625–585 B.C., king of Media and founder of the Median Empire. Cyaxares defeated the invading Scythians, captured Nineveh, with the aid of Nabopolassar of Chaldea, 612 B.C., and overran Assyria and northern Mesopotamia. After 590 B.C. he was at war with Lydia.

CYBELE, a goddess whose worship originated in Asia Minor. Regarded as the mother of the gods, as the bringer of civilization, and the protectress of cities, she was represented as adorned with a turreted crown. Her worship was orgiastic and clamorous, her chariot being drawn by lions and attended by priests known as Corybantes, dressed in full armor and playing on horns and cymbals. The Greeks identified her with Rhea, the earth goddess. During the second Punic War the worship of Cybele was introduced in Rome, 204 B.C., after a Sibylene oracle had prophesied that she could put Hannibal to flight. A stone was brought to Rome from her shrine at Pessinus in Galatia, and a temple was built for her worship. Adopted by the state, her cult hindered the spread of Christianity.

CYBERNETICS, derived from the Greek word for steersman, is the study of control and communication in animals (including human beings) and machines. Cybernetics uses methods developed in the theory of mathematical statistics to investigate certain analogies between physical and biological systems. In cybernetics, communication means the receiving and digesting of information; control means the use of this information to direct the actions of a system. An example of the type of analogy of interest to cybernetics is the comparison between a gunfire control system and a cat hunting a mouse. Each receives information about its target (the control system by radar and the cat by sight); the information in both cases is a statistical time series. Each computes what should be done to hit its target. The control system uses a feedback circuit, which compares the present direction of the gun with the desired one and acts to bring this error to zero. There is evidence that the cat's brain carries out a similar calculation, based on past experience. Finally, each issues orders to carry out the proper action—the control system through servomechanisms and the cat through nervous control of its muscles (see ANTIAIRCRAFT DEFENSE; NERVOUS SYSTEM; SERVOMECHANISM). Likewise the human brain and nervous system have features in common with a large calculating machine, which includes a memory for information storage, a control unit, and an operating unit (see CALCULATING MACHINE).

In engineering, cybernetics lays primary emphasis on the qualitative interactions among the various components of a system and on the behavior of the system as a whole. It tends to neglect the classical concepts of energy and power efficiency as tools for analysis. Engineering applications include con-

trol of guided missiles, design of high-fidelity audio circuits to minimize noise, and control of error in unreliable systems (see AUTOMATION; GUIDED MISSILE). In biology, cybernetics has provided insight into the nature of various nervous and muscular disturbances. It has also helped give a rational basis for the design of location devices for the blind and for improved artificial limbs; this includes measuring the nerve excitations that tell the position of a limb and finding ways to simulate them. A final area that links mind and machine is experimentation with mechanical translation of languages.

WILLIAM F. WHITMORE

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CHICAGO NATURAL HIST. MUS.

***Dioon spinulosum*, topped by a rosette of spreading leaves, is one of the tallest of the cycads and is commonly found in Mexico. Its seeds are used as food by the inhabitants.**

CYCAD, one of a group of fernlike or palmlike tropical and subtropical evergreen plants comprising the family *Cycadaceae* (see BOTANY, *Spermatophyta*). The family includes nine genera with about 100 species. Five genera are found in the Old World, including *Cycas*, *Macrozamia*, *Bowenia*, *Encephalartos*, and *Stangeria*. The four New World genera are *Dioon*, *Ceratozamia*, *Microcycas*, and *Zamia*. All relate to forms dating from the Carboniferous period.

CHICAGO NATURAL HIST. MUS.

Cycas media

The stems of some species are tuberous and subterranean, rising only slightly above the ground. The stems of other species are columnar and may attain heights of 60 feet. The columnar stems are armored with leaf bases and are seldom branched. The leaves, varying from several inches to 9 feet in length are pinnate and leathery, and so constructed as to require little water. They are spirally arranged in a dense crown and once they appear may live for several years. The cones, or stroboli, are unisexual, that is, they may be male, bearing pollen, or female, bearing ovules. See REPRODUCTION IN PLANTS.

Seed cones of an Australian species, genus *Macrozamia*, are more than 3 feet long, may weigh nearly 90 pounds, and are the largest known in the plant kingdom. The Asiatic genus *Cycas* does not bear female cones, but instead has fertile leaves that resemble other small vegetative leaves except that they bear two to eight ovules near the base.

Several species are widely cultivated out of doors or in greenhouses in the United States. These species include *Cycas revoluta*, the dark green leaves of which are commonly used for funeral wreaths. The seeds of the African bread palm, *Encephalartos caffer*, are used for making bread, and American Indians ate the underground stems of several species of the genus *Zamia* found in Florida. Fossil cycads have been identified in deposits from the Triassic period. Fossils of plants commonly called cycads and found in deposits of the earlier Mesozoic era are not placed in the family *Cycadaceae*. See GEOLOGIC TIME.

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CYCLADES, Kikladhes, or Kyklades, is an island group in the Aegean Sea, forming a province of SE Greece, extending SE from the coast of Attica and Euboea; area 1023 sq. mi.; pop. (1951) 121,256. The largest islands are Amorgós, Anafi, Andros, Ios (Nio), Kéa (Ceos or Zea), Kíthnos (Cythnus), Mílos (Melos), Náxos, Páros, Sérifos, Sífnos, Síkinos (Sicinus), Síros (Syros), Thíra (Santorin), and Tínos (see map in Atlas, Vol. 20, Greece, Albania, and Western Turkey). The capital is Hermoupolis (Síros) on the island of Síros. The mild Mediterranean climate with light precipitation encourages the production of citrus fruits, figs, olives, grapes, and tobacco. Most of the islands are mountainous and are composed largely of slate, gneiss, and limestone. The southern islands of Mílos and Thíra are volcanic. Mineral resources of the group include hematite, sulfur, emery, bauxite, marble, and lead. Granite has been quarried on some of the northern islands since ancient times.

The islands' first inhabitants were from Caria; they were followed by Minoans from Crete. Ionians occupied the northern islands and Dorians the southern islands about 1000 B.C. The group was successively ruled from Athens, Samos, and Náxos. The Cyclades were attacked by the Persians in 490 B.C. They came under the control of the Delian League about 478 and of the second Athenian Confederacy a century later. The islands were taken by Mithridates, king of Pontus, in 88 B.C. During the Middle Ages most of the group was ruled by Venice with the seat of government at Náxos. The Cyclades were surrendered to the Turks in 1566 and remained under Turkish rule until 1832, when the Greeks gained control. During World War II most of the larger islands were occupied by German troops. A severe earthquake shook the Cyclades in 1956, causing the deaths of 43 persons on the island of Thíra. See HERMOUPOLIS; MELOS.

Delos Island, one of the Cyclades group, is famous for the ancient Greek sculptures, more seal-like than lionlike in appearance, that stand guard along its Street of Lions.

EWING GALLOWAY

CYCLAMATE SODIUM is a white crystalline powder about 30 times sweeter than sugar, for which it is used as a substitute. Cyclamate sodium is readily soluble in water and stable in hot solutions. Although it is nontoxic, excessive amounts may have a laxative effect. Cyclamate sodium may be used by those who must restrict carbohydrate intake, such as diabetics. The sodium content of this preparation is a consideration when dietary sources of this salt must also be restricted, as in persons with severe kidney damage. The calcium salt, cyclamate calcium, may be used under such circumstances. Cyclamate calcium is eliminated slowly but completely from the body and does not appear to interfere with the normal digestive processes. Both forms are nonnutritive.

CYCLAMEN, a genus of about 20 species of low perennial herbs belonging to the primrose family, *Primulaceae*. Cyclamens are native to the Mediterranean region, but have been introduced to the United States. The plants have large flowers with recurved petals. The flowers occur in many shades of red or white and contrast sharply with the spotted heart-shaped leaves. Florists' cyclamen, *C. indicum*, is a hybrid that was developed from *C. persicum*. Its flowers are white, or shades of purple or rose, and profuse. Propagation is by tubers or seeds. Cyclamen grow best in slightly acid soil.

USDA

Cyclamen in Bloom

CYCLE, derived from the Greek word meaning circle, is a series of events, changes, or fluctuations which recur and which may end or repeat themselves. Probably the most common cycles are the day, which is the earth's rotation on its own axis, and the year, which is the earth's journey around the sun. The development of statistical methods has revealed cycles in many areas.

Cycles do not imply regularity in time intervals. Regular cycle, rhythm cycle, and rhythmic cycle are those cycles that repeat themselves at fairly uniform time intervals. The beating of the heart, for example, is rhythmic, though it may be slightly irregular. A periodic cycle is one that repeats itself at mathematically exact intervals; true periodicity probably does not exist in nature, but there are close approximations. See Alternating Current; Business Cycle; Carbon Cycle; Electromagnetic Wave; Frequency; Geology, *Geological Cycle;* History; Hydrologic Cycle; Internal Combustion Engine, Engine Cycles; Nitrogen Cycle; Period; Periodic Table; Radio; Reproduction in Animals; Reproduction in Plants; Social Change, *Cyclical Theories;* Solar Cycle; Statistics, *Methods and Practices;* Sunspot, *The Sunspot Cycle;* Wave.

CYCLIC COMPOUND. See Organic Chemistry, *Cyclic Compounds.*

CYCLING. See Bicycle; Bicycle Racing.

CYCLOFORM. See Local Anesthetic.

CYCLOID, the curve which is traced by a point on a circle that rolls in its own plane along a straight line. For example, a point on the rim of a wheel rolling on level ground will trace an arc of a cycloid for each revolution (Fig. 1). Adjacent arcs meet at a point called a cusp, as shown at *A* and *B*. The length of one arc is $8r$, where r represents the radius of the generating circle. The area under one arc and above the base line *AB* is $3\pi r^2$, or three times the area of the generating circle.

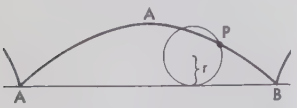


Fig. 1. A Cycloid

Two properties of the cycloid are of special interest. First, a cycloidal pendulum may be made by fastening a string of length $4r$ to the cusp produced by the meeting of two inverted cycloidal arcs generated by a circle of radius r (Fig. 2). A small weight attached to the end of the string will swing between point *E* and point *D*. Christian Huygens (see Huygens, Christian) discovered that the small weight moves along an inverted cycloidal arc (Fig. 2), and the time required to transverse the distance *ED* is independent of the length, or amplitude, of the swing (see Period) along the arc. A cycloidal pendulum is isochronous (see Isochronism), that is, its period does not depend upon the length of its swing. In contrast, the period of a pendulum that swings in a circular path is dependent upon the length of the swing (see Pendulum). The second property of a cycloid, which is apparent in engineering problems, is its path of quickest descent, or brachistochrone. A particle moving without friction will travel the distance from the midpoint of the arc *AB* (Fig. 1.) to *A* in less time than it takes to traverse any other curve connecting points *A* and *B*. See Calculus of Variation.

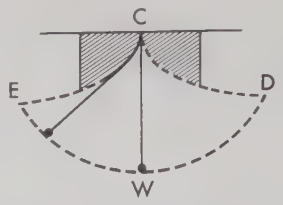


Fig. 2. A Cycloidal Pendulum

Fig. 3. A Curtate Cycloid

Fig. 4. A Prolate Cycloid

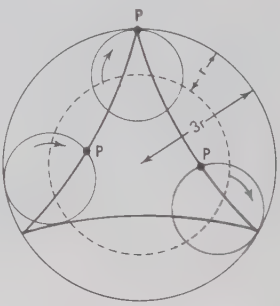


Fig. 5. A Hypocycloid

The cycloid is one of a set of plane curves traced by points related to a rolling circle. In Fig. 3 a curtate cycloid is generated by a moving point outside of a circle traveling on a straight plane. A prolate cycloid is shown in Fig. 4; here the point is inside the circle traveling on a straight plane. The circle may also roll along some fixed curve instead of a straight line. For example, when the radius of a fixed circle is three times that of a circle rolling inside the fixed circle, the result is a closed curve which is a hypocycloid with three cusps (Fig. 5). A point in a circle which rolls on the outside of a fixed circle traces an epicycloid (Fig. 6). If the radius of

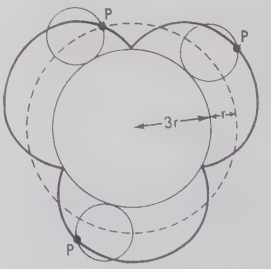


Fig. 6. An Epicycloid

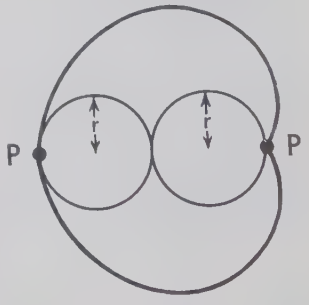


Fig. 7. A Cardioid

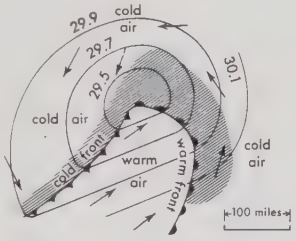
the rolling circle is equal to the radius of the fixed circle the epicycloid becomes a heart-shaped curve called the cardioid (Fig. 7). Curves of these types are used in the design of gears and other mechanisms for the translation of motion. The cycloid and its related curves are examples of a more general class of curves known as roulettes. See CURVE; ANALYTIC GEOMETRY.

M. L. HARTUNG

CYCLOIDAL PROPELLER. See PROPELLER, MARINE.

CYCLOMETER, an instrument for recording the revolutions of a wheel, usually a bicycle wheel. It consists essentially of a small gear, one tooth of which is moved forward with each revolution of the wheel by means of a stud attached to one spoke. The gear is connected to a dial that translates revolutions of the wheel into mileage.

CYCLONE, an area of circular or nearly circular low atmospheric pressure, usually attended by fresh to strong breezes, cloudiness, temperature changes, rain or snow, and other phenomena that mark the ordinary day-to-day changes in the weather. In the United States these "lows" cover an area of 500 to 1500 miles. They move in an easterly direction, usually between 30° and 60°N latitude, and tend toward the north, passing into the Atlantic and on toward Iceland.



Circular lines, or isobars, in a cyclone represent areas of uniform barometric pressure. The shaded portions indicate areas in which rain or snow is probable.

The winds flow into the cyclone from the land or sea in a counterclockwise direction in the northern hemisphere, clockwise in the southern hemisphere. The warmth and moisture from the earth are carried upward in the cyclone vortex, cooling and condensing to form clouds which spread within and ahead of the low pressure. The location and direction of travel of the center of the cyclone may sometimes be determined by watching the ground-wind direction and the travel of clouds at different heights. Cirrus clouds spread farthest in advance and are the first to be noted when the cyclone approaches (see CLOUD). If the wind shifts to the south in advance of the cyclone, the center of the cyclone probably will pass to the north, its nearness and speed of travel being indicated by the rate of wind shift. Should the wind shift to the north in advance of the cyclone, the center of the cyclone will probably pass to the south. With the approach of summer, cyclones may develop severe local squalls and tornadoes on their southeasterly front. Since the tornado is a small low-pressure area, usually with counterclockwise winds, it is a species of cyclone. See TORNADO.

There are two principal kinds of cyclones: (1) tropical, common to tropical latitudes, especially during summer and autumn; and (2) extratropical, common to other latitudes. Tropical cyclones range in diameter from about 50 to 300 miles and have violent winds, often reaching a velocity of more than 100 miles an hour. At the center a calm exists, around which are found the highest winds in the storm. Generally the isobars, or lines on the weather map connecting points of equal barometric pressure, are nearly circular. The temperature distribution is nearly equal in every direction and there are no fronts, or peripheral air masses which differ in temperature appreciably from that of the cyclone. The hurricane and the typhoon are fully developed tropical cyclones. See HURRICANE; TYPHOON.

Extratropical cyclones have diameters of approximately 1500 miles. Characteristic of the accompanying storm are winds which are light at the edges, increasing near the center to 30-mile-an-hour gales. Precipitation and cloudiness over an area of thousands of square miles are also characteristics. This type of cyclone usually has strong fronts. Winds at the front shift direction sharply as the front passes, and there are usually sudden changes in temperature and precipitation. The principal fronts are (1) cold fronts, in which the temperature drops quickly and showers begin; (2) warm fronts, in which the rain ceases and the temperature rises; and (3) occluded fronts, in which the cold front overtakes the warm front, with the likelihood of stormy weather on both sides.

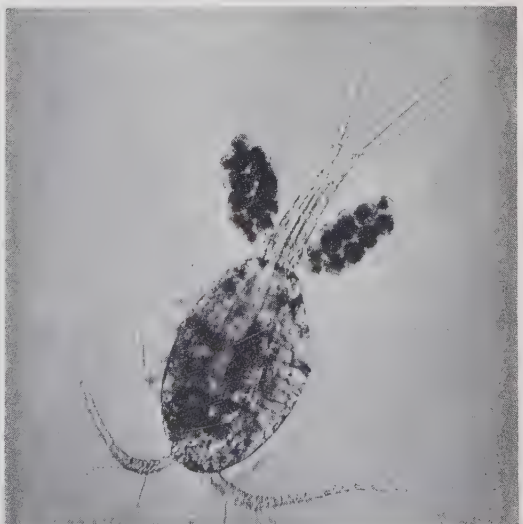
IVAN RAY TANNEHILL

CYCLOPEDIA. See ENCYCLOPEDIA.

CYCLOPES or **CYCLOPS,** in Greek mythology, a giant one-eyed monster. Homer represents them in the *Odyssey* as a race of wild and lawless shepherds living on the isle Trinacria (probably Sicily). Their leader was Polyphemus, who had been blinded by Odysseus. Hesiod depicts them as Titans, three in number (sons of Uranus and Ge), who gave Zeus his thunderbolts and helped him in his fight with Cronus. Later writers regarded the Cyclopes (Cyclops) as assistants of Hephaestus (Vulcan), living on Mount Etna and the volcanic Lipari Islands. The great walls of unhewn, uncemented stone in Mycenae at Tiryns, and elsewhere in Greece and Italy, dating to a period perhaps as early as 3000 B.C., are sometimes regarded as their work, and are called Cyclopean masonry.

CYCLOPROPANE is a colorless gas used as a general inhalation anesthetic (see ANESTHESIA). Cyclopropane is so potent that it will produce analgesia (see ANALGESIC) even when given in very small amounts. It is often a preferred anesthetic because of the wide margin of safety between lethal and anesthetic doses of the gas. Because oxygen is used as a diluent in cyclopropane anesthesia, adequate amounts of oxygen can be deposited in the tissues and asphyxia will not result (see ASPHYXIA). Cyclopropane is absorbed quickly and produces the necessary muscular relaxation without depressing heart action or the circulation. Recovery from the anesthesia is rapid and smooth, with a minimum of distressing aftereffects. Cyclopropane is an isomer of propane, C_3H_6; it is flammable and, in mixture with air or oxygen, will explode upon contact with a flame or spark.

CYCLOPS, a genus of minute free-swimming, fresh-water animals (see CRUSTACEA, *Copepoda*). This



P. S. TICE

Greatly magnified photograph of a female cyclops, a fresh-water copepod, shows conspicuous brood pouches attached to sides of body. Unique feature is a single median eye.

ATLANTA C. OF C.

The Battle of Atlanta cyclorama, largest of its kind in the world, was painted in Milwaukee about 1890 by three German artists. It is now owned by the city of Atlanta.

segmented crustacean is 1.5 to 5 mm in length and resembles a stalked pear in shape; it is usually greenish in color. Mature females have conspicuous egg sacs on each side of the body. An outstanding characteristic is the single median eye. *Cyclops* is the intermediate host for the Guinea worm, *Dracunculus medinensis*. See GUINEA WORM.

CYCLORAMA, a painting executed on a curved surface, usually the walls of a circular room. It is an effective way to depict vast scenes and complex action, of which the spectator has such comprehensive view that he may easily consider himself a part of the scene. Cycloramas were a popular form of entertainment in the late nineteenth century, both in large cities and on tours. Among the most famous cycloramas in the United States are those of the Battle of Vicksburg, the Battle of the *Monitor* and the *Merrimac*, the Battle of Atlanta, and the Battle of Gettysburg. The last named was shown at the Century of Progress Exposition, Chicago, 1933–34. Perhaps the most famous European cyclorama is that located on the site of the battle of Waterloo. In the theater the cyclorama curtain is a curved, movable backdrop painted on canvas. It is used to show great depth, as in outdoor landscape scenes.

CYCLOSTOMATA, a class of elongated freshwater and marine animals that includes the hagfishes, genus *Myxine*, and the lamprey, genus *Petromyzon* (see HAGFISH; LAMPREY). These animals are often described as fish (see FISH), but differ from fish in that they have no differentiated head, jaws, scales, paired appendages, or bony skeleton. They breathe by means of paired gill-pouches through which incoming and outgoing water passes. The mouth is round and suctorial, enclosing a rasplike tongue and buccal teeth. Many cyclostomes are parasitic upon fish, attaching themselves by means of their teeth and suction. Fossil relatives of cyclostomes, the ostracoderms, have been found in deposits dating from Silurian and Devonian times (see GEOLOGIC TIME).

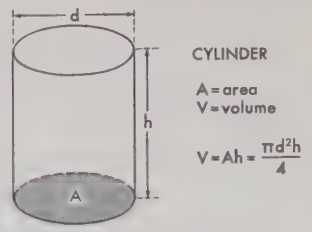
CYCLOTRON. See ELECTRON AND ION ACCELERATORS, *Cyclotron*.

CYDNUS RIVER. See TARSUS RIVER.

CYDONIA. See KHANIA.

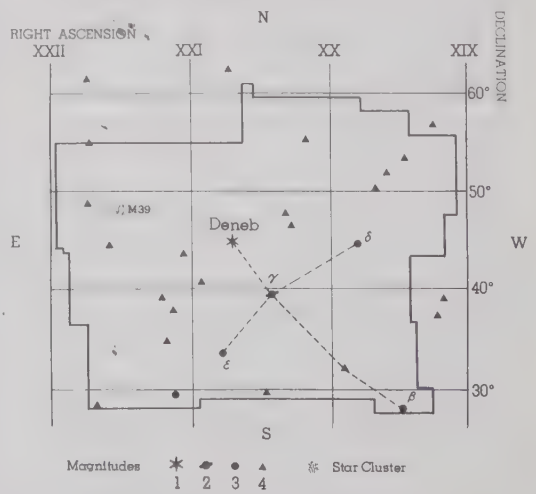
CYGNUS, the Swan or Northern Cross, is a constellation situated between Draco and Pegasus and lying almost entirely within the Milky Way (see CONSTELLATION; MILKY WAY, *Forms of Matter in the System*). Eight of the chief stars in Cygnus form the Northern Cross which is visible from the Northern Hemisphere in December and extends over 20 degrees of the Milky Way. The supergiant first magnitude (see MAGNITUDE) star Deneb (see DENEB) is located at the top of the cross and β Cygni at the base. See COALSACK.

CYLINDER, a curved surface formed by moving a perpendicular line along the points of a plane curve. If the perpendicular line moves along the points of a circle, the surface generated by the line is a right cylinder. (See figure.) In right cylinders such as tin cans, steampipes, and silos, the surface is limited by planes that are usually parallel to the plane of the circle. When the surface of the cylinder is so limited, the area of the curved surface is equal to the circumference of the circle multiplied by the length of the cylinder; the volume of the cylinder is equal to the area of the circle multiplied by the length of the cylinder. Cylindrical surfaces may also be parabolic, elliptic, or hyperbolic (see CONIC SECTION). The shape of a cylinder allows it to resist high internal pressures and has led to its wide use in industry. See INTERNAL COMBUSTION ENGINE.



CYLINDER, a chamber in which a piston moves back and forth. It is a basic element of reciprocating engines, in which expanding gases in cylinders push pistons to perform useful work (see INTERNAL COMBUSTION ENGINE; STEAM ENGINE). Other cylinder-and-piston arrangements use air or a liquid as a medium for power transmission. These include the pneumatic and hydraulic cylinders in jacks, air hammers, presses, and lifting devices (see HYDRAULIC MACHINERY; PNEUMATIC TOOL). Still other applications are found in pumps and compressors for gases and liquids. See COMPRESSOR; PUMP.

CYMBAL, one of a pair of percussion instruments known from antiquity, but of obscure origin. Each cymbal is a hand-made round metal plate, available in many sizes and thicknesses, generally of brass or steel although proportions of the constituent metals are kept secret by the maker. Cymbals are usually but not always used in pairs. When paired the plates are normally of indefinite but different pitches (often one low, one high); they are struck together in a frictional motion so as to produce a brilliant, shimmering clatter. European music makes sparing use of the cymbals, but the music of the Orient gives them greater prominence and it is probable that they are of Oriental origin; they appear to have entered European music by way of Turkey, where the best cymbals are made. Cymbals of various types are commonly part of the American jazz player's set of drums, and are usually thinner than those used by the sym-



Constellation Cygnus

phony orchestra (see DRUM). Early jazz employed cymbals for special effects only; later it became fashionable among some jazz drummers to use them incessantly.

CYMBELINE, or Cunobelinus, died A.D. ?43. King of Britain and the father of Caractacus, he established his capital at Colchester and became a wealthy and powerful ruler. An ally of Augustus, Cymbeline considered Britain a part of the Roman Empire. Shakespeare's *Cymbeline* is named for the king, but is not historical.

CYME is a flower cluster, or inflorescence, in which the central and terminal flowers on the stalk open first. Younger flowers open progressively from top to base or from center to outer edges of the inflorescence. Growth of the central stalk stops when the first flower is produced. This type of inflorescence is much less common than the racemose. (See RACEME.) An example of the simplest type of cymose inflorescence is the flower cluster of the crab apple, *Pyrus coronaria*. See INFLORESCENCE.

CYMOPHANE. See CAT'S-EYE.

CYMRU. See WALES.

CYMRY, the Welsh people. The predominantly Celtic inhabitants of Britain who were pressed into Wales by the Angles, Saxons, and other invaders in the sixth century called themselves Cymry, and the land Cymru. See CELTS; WALES.

CYNEWULF, Anglo-Saxon poet of the eighth century, was probably a native of Northumberland. He was the author of at least four poems in the "Exeter Book" and the "Vercelli Book" and may have composed some of the other poems in these manuscripts. The poems which are definitely attributed to him are "The Christ," "The Passion of St. Juliana," "Elene," and "The Fates of the Apostles," all of which contain acrostics that spell out his name in runic letters. With the exception of Caedmon, Cynewulf was the only one of the Old English vernacular poets whose works can be identified. Striking examples of his lyric exaltation and imagery are the rhapsodic hymns of "The Christ" and the descriptive passages in "Elene." The poems also show that he was a Latin scholar, familiar with the religious literature of the day; he may have been a churchman. See EXETER BOOK.

CYNICISM, in modern times, is contempt for the customs, institutions, ideals, and motives of man; cynics display a scornful air of superiority to all values. The original Cynics, who gave their name to those in succeeding centuries, were disciples of Antisthenes, a Greek philosopher of the early fourth century B.C. They were called Cynics possibly because they gathered at Cynosarges Gymnasium—or perhaps because they lived like dogs (*kyon*). Antisthenes studied rhetoric under Gorgias and later became a disciple of Socrates, from whom he learned that to be virtuous is more important than to be wealthy and influential or to lead a life free from pain. He was taught that virtue is superior to science, etiquette, and logic; that happiness is impossible without virtue and that the good man obeys its dictates even at cost of unpopularity and the enmity of society. Antisthenes, in turn, taught that virtue is the cultivation of complete individual independence. The good man is indifferent to pain and is actively opposed to pleasure (as being more likely to seduce him from virtue); he is equally indifferent to honor and disgrace. Virtue's self-sufficiency does not need (and does not want) the distractions of religion, marriage, economic or social ties, or any of the other human relationships that ordinarily constitute the fabric of civilization. All that virtue demands is the opportunity to assert the responsibility of the individual through living a life determined solely by the will. The Cynics thought science worthless and logic useful only to show us the absurdity of saying anything about anything, since to them all statements were either tautologies or falsehoods. See ANTISTHENES.

Among the early Cynics were Diogenes of Sinope, Crates, Stilpo, and Zeno (who later founded the Stoic school). Stories are told of Diogenes that he carried a lamp in his search for an honest man; that he lived in the open and slept in a tub; that he practiced vicious indecencies in public in order to show his contempt for opinion; and that when Alexander the Great came to see him and asked if there were any favor he could do for him, Diogenes, who was basking in the sun at the time, said, "Yes, please stand a bit out of my light." See DIOGENES; ZENO.

Cynics flourished again in the first and second centuries in Rome. Leading Cynics in this period were Demetrius (a friend of Seneca), Oenomaus, and Demonax (praised by Lucian). Although faithful to Antisthenes' principles they must have lived more respectably, since they were ranked with the Stoics in the esteem of the Romans.

Historically Cynics are important because they opposed the Cyrenaics (another self-styled Socratic school) concerning the end of virtue. To the Cynics virtue had intrinsic moral worth; to the Cyrenaics virtue existed to make life more enjoyable. This opposition continued between the Stoics (descendants of Cynicism through Zeno) and the Epicureans (descendants of Cyrenaicism) throughout ancient history. (See CYRENAICISM; EPICUREANISM; STOICISM.) Although Cynics did well to emphasize will in determining one's destiny, their negative, forbidding virtue could never guide men to a good life. E. B. COSTELLO

CYNODON, a genus of perennial creeping grasses native to warm regions of Europe and Asia and also to Australia. About four species comprise the genus. *C. dactylon*, or Bermuda grass, may grow to a height of 12 inches. It is used as a lawn grass in the southern United States, but is not especially suitable for that purpose.

CYNOSCEPHALAE, range of low hills in Greece, in Thessaly, 15 miles SE of Larissa. Here in 197 B.C. Philip V of Macedon was defeated by the Roman legions under T. Quintius Flaminius. As a result, Philip's power in Greece was lost and the Roman position strengthened.

CYNTHIA, one of the many names of the Grecian goddess Artemis, the Roman Diana.

CYNTHIANA, city, NE Kentucky, county seat of Harrison County; on the South Fork of the Licking River, the Louisville and Nashville Railroad, and U.S. highways 27 and 62; 25 miles NNE of Lexington. Cynthiana was founded in 1793 and incorporated in 1806. It was named for the two daughters of the first settler, Robert Harrison. Flour, feed, tobacco, whisky, and lumber are processed here, and clothing and harness are made. Stone is quarried nearby. General John H. Morgan raided the city twice during the Civil War. Pop. (1950) 4847.

CYPERUS, a large genus of rushlike plants of the sedge family, *Cyperaceae*. There are about 600 species found in both tropical and temperate regions. The plants are annuals or perennials bearing grasslike leaves and small spikes of bisexual flowers. The Egyptian paper plant, *C. papyrus* (formerly *Papyrus antiquorum*), grows to about 8 feet in height (see PAPYRUS). *C. esculentus*, the chufa or earth almond, produces small edible tubers that are used for fodder. The umbrella plant, *C. alternifolius*, grows to a height of about 4 feet and bears long, drooping leaves in a circle at the top of the slender stem.

CY PRES, a doctrine of law applied in the construction of wills to carry out the intention of the testator as closely as possible without violating the rule against perpetuities. Courts have exercised their discretion under this doctrine by so construing the words in a will as to prevent a devise from failing altogether because the testator attempted to create an estate in perpetuity. Cases of this type frequently arose out of attempts to make devises or bequests for charity. The doctrine has been expressly repudiated in many states.

E. E. STANFORD

Uncultivated Monterey Cypress, Deformed by Wind Action

CYPRESS, various aromatic, cone-bearing evergreen trees belonging to the cypress family, *Cupressaceae*. About 120 species comprise the family. The Italian cypress, *Cupressus sempervirens*, is used in ornamental planting and in cemeteries. Legend has it that the cross of Christ was fashioned in part from its wood. The Monterey cypress, *C. macrocarpa*, is native to the coast of California, where it is often deformed by the prevailing winds from the ocean and forms picturesque groves of old trees which seem to creep on the ground. In cultivation it is a handsome and symmetrical tree. These cypresses have small, opposite, scale-like leaves, closely appressed to the branches. They range from 40 to 70 feet in height and reach maturity in two years. The seed cones are small and globular, with several seeds attached to each scale. Besides the true cypresses, a number of species of the closely related genus *Chamaecyparis* are often called cypress, false cypress, or cedar (see CEDAR). Several forms of ornamental cypresses are known to gardeners as *Retinospora*.

CARROLL CHOUINARD

Common bald cypress trees at Cypress Gardens near Winter Haven, Fla., exhibit the characteristic buttresses at the base of the trunk and the "knees" arising from the roots.

Cypress wood is valuable not only for the ease with which it is worked, but for its ability to withstand rot. Most of the lumber called cypress, however, is the wood of *Taxodium*. The best-known species is the common bald cypress, *T. distichum*, of southeastern United States. It grows principally in swamps, and develops large buttresses at the base of the trunk and peculiar outgrowths called knees that arise from the roots, often at some distance from the trunk. When this species is cultivated in ordinary ground these peculiarities are lacking. The bald cypress may attain a height of 150 feet, a trunk diameter of 12 feet, and an age of 2000 years. Another species of great interest is the Montezuma cypress, *T. mucronatum*, native to Mexico. The Spanish conquerors were amazed at the giant stature of these trees, many more than 1000 years old. The most famous survivor is the big tree of Santa María del Tule in Oaxaca, which has a circumference of about 150 feet. It is possible that this most massive of living plants has resulted from the growing together of several individuals.

Cypress wood varies greatly in color but is usually some shade of brown. It is frequently used for shingles, exterior siding, blinds, and sashes, and for fence posts, railings, and other structures exposed to the weather.

CYPRESS BAYOU or **CYPRESS CREEK,** in NE Texas and NW Louisiana, rises N of Winnsboro, Tex., and flows SE for its entire course of 132 miles through several bayous and channels and Caddo Lake to the Red River at Shreveport, La. Although the Cypress Bayou proper ends where it enters Caddo Lake, the name is frequently applied to the entire waterway. Along its course are flood control reservoirs.

CYPRESS HILLS, range, S Canada, extending for about 100 miles in SW Saskatchewan and SE Alberta. The highest point rises to nearly 5000 feet. The eastern section of the hills is a coal mining region.

CYPRESS VINE, a climbing annual belonging to the morning-glory family, *Convolvulaceae*. The cypress vine, *Quamoclit pennata*, and its *alba* variety have scarlet and white flowers, respectively. These flowers grow to a length of about 1½ inches. The plants are easily cultivated and are very decorative. They are native

to the East Indies, but are found from the southern United States to the tropical regions of South America.

CYPRIAN OF CARTHAGE, SAINT, full name Thascius Caecilius Cyprianus, 200?–258, Christian bishop and martyr, was born in North Africa. Of wealthy family and trained for the law, he achieved prominence as a teacher of rhetoric at Carthage. A pagan until 246, he was converted to Christianity by Caecilianus, an aged priest with whose family Cyprian lived after having sold his property. Famous as an orator and an administrator, Cyprian was ordained a priest in 247, and in 248 was consecrated bishop of Carthage. In 249, when the Roman emperor Decius banned Christian worship, Cyprian retired to write some of his famous treatises. Returning to Carthage in 251 in an attempt to prevent a schism over the reconciliation of lapsed Christians, he held seven councils of faction leaders, thereby strengthening the position of the church in North Africa. But in 257, in the face of Emperor Valerian's persecution of Christians, Cyprian refused to become an apostate and was banished to Curubis, only to be recalled in 258. Shortly afterward he was haled before the Roman consul, strenuously questioned, and condemned to death; he was beheaded the next day. He was one of the great Christian Latinists; his best known work is *De unitate Catholicae ecclesiae*, which affirms the principle of one church. His *Ad donatum*, *De opere et eleemosynis*, and *Letters* are important in the study of ecclesiastical law and church history. Cyprian's feast day is September 16.

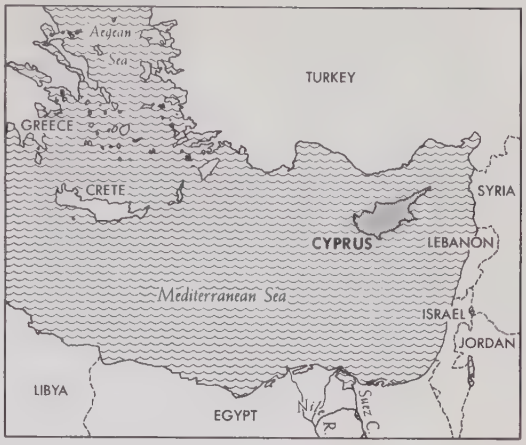
CYPRIPEDIUM. See Lady's-Slipper.

CYPRUS or **KYPROS,** island, a British crown colony, in the E Mediterranean Sea; 40 miles S of the coast of Turkey and 480 miles SE of the mainland of Greece; area 3572 sq. mi.; pop. (1946) 450,114; (1955 est.) 517,000. The island measures about 140 miles at its greatest length; from north to south it is about 60 miles at its broadest point. The capital is Nicosia.

Physical Factors. Two parallel mountain ranges traverse the island from east to west, with a broad alluvial plain between them. The Olympus Mountains in the south are higher and more extensive, culminating in Mount Troodos, or Olympus, at 6406 feet, the highest point on the island. The Kyrenia Mountains extend west from the Karpas Peninsula in the northeast along the northern coast and rise to 3343 feet in Mount Akromandra. The central plain, Messaoria, is a broad treeless area from 10 to 20 miles wide extending from the Bay of Famagusta on the east to the Bay of Morphou on the west. It is drained to the east by the Pedias and Ialias rivers. The Olympus Mountains area, the principal mining region, is also popular as a resort because of its cool summer climate. The mean temperature is 67°F. The summers are dry and hot on the interior plain. Average annual precipitation is about 21 inches, most of it coming during the winter, October through March. The native vegetation, sparse with some conifers, is much like that of the neighboring coasts of Turkey and Syria.

Social and Economic Factors. About 80 per cent of the Cypriotes are Greeks. Turks represent the largest minority, 18 per cent, and the remainder are chiefly Armenians. The religious ties of the people follow about the same distribution. The Greeks are Greek Orthodox Christians and the Turks are Moslems. The official languages are Greek, Turkish, and English. The educational institutions are organized on a language and ethnic basis. In 1952 there were 714 elementary schools: 494 Greek, 207 Turkish, and 5 Maronite—under public administration; 4 Armenian and 4 Latin under private management. There were 54 secondary schools and five other training schools. Illiterates, about 30 per cent of the population, are found mainly among the elderly persons.

About half of the total land area of Cyprus is devoted to agriculture, half of this cropped annually



Location Map of Cyprus

and the rest used as pasture. Most of the agricultural land lies within the central plain, where some irrigation is practiced. The principal agricultural products are barley, citrus fruits, carobs, potatoes, grapes, olives, vetches, flax, raisins, hemp, cotton, and almonds. Manufactured products include wine, olive oil, cheese, and textiles. Livestock raising is important and mules and donkeys from Cyprus are readily sold in the Near East. Products of the mining industry are copper and iron pyrites, asbestos, gypsum, terra umbra, chromite, and ocher. Salt is produced by evaporation from saline ponds. Sponge fishing is carried on near the coast during the summer.

Cyprus has long had an unfavorable export-import balance, but after World War II there was a renewed effort to develop the island's industrial potential. The chief exports are copper, iron, asbestos, carobs, potatoes, citrus fruit, barley, confectioneries, and

BLACK STAR

Shown is the courtyard of Kykko monastery, one of the most famous in the Greek Orthodox world, built in the eleventh century with funds given by a Byzantine emperor.

INT. NEWS

A Cypriote peasant, with his goats on a leash, drives a hard bargain with a prospective purchaser in the cattle market at Nicosia, capital of the Mediterranean island.

INT. NEWS

The simple loveliness of a Cypriote girl from Famagusta helps perpetuate the ancient legend that Venus, goddess of beauty, sprang from the waves on the shores of Cyprus.

wine. The principal imports are wheat, electrical goods, machinery, vehicles, paper, petroleum products, chemicals, wood, cement, iron, steel, and cotton and woolen fabrics. The chief trading partners of Cyprus are Great Britain, Germany, the United States, Italy, and Egypt.

The island has very few harbors. Famagusta, on the east coast, and Limassol, on the southwest coast, are the largest ports. Larnaca, on the southeast coast, has only an open roadstead, and lighters carry cargoes to the 900-foot pier. Minor ports are Paphos, on the west coast, and Kyrenia, on the north. A narrow-gauge railway extends from Famagusta through Nicosia to Lefka, near the west coast, a distance of about 70 miles. There are about 900 miles of main roads and 2000 miles of secondary roads. Several international airlines provide scheduled service.

Antiquities. There are many and varied archaeological remains on Cyprus, ranging from the ruined cities of Amathus, Citium, Curium, Idalium, Salamis, and Soli to Gothic churches and monasteries, Byzantine castles, Islamic mosques, and Venetian fortresses. Neolithic settlements that date from 4000 to 3000 B.C. have been excavated. Later settlements are divided into three periods: Early Cypriote, from 3000 to 2100 B.C.; Middle Cypriote, from 2100 to 1600 B.C.; and Late Cypriote, from 1600 to 1000 B.C. Comparisons of pottery from the Early Cypriote period are made with that of Anatolia. In Late Cypriote times, Cyprus was oriented toward the west and there is much evidence that it developed into a great commercial center and prospered in the Mycenaean world. At this time much trade was carried on with the Aegean islands and former associates in the Near East. So much pottery of this period has been found in Syria that the possibility remains that Cypriotes established factories along the coast of Syria. In the Late Cypriote period the island first appeared in recorded history when it was mentioned in Egyptian texts as a conquest of Thutmose III. Much of the prosperous trade of the Middle and Late Cypriote periods is attributed to the fact that Cyprus was the chief source in the eastern Mediterranean region of copper, which derives its name from Cyprus. At the close of the Late Cypriote period, there is in the history of the island a period of obscurity that accompanies the fall of the Mycenaean world. See ARCHAEOLOGY; MYCENAEAN CIVILIZATION.

Government and History. Cyprus is a British crown colony that is headed by a governor who is appointed. Although the governor is advised by an executive council, he is granted the power to make the laws. The island is divided into six administrative districts named after the principal towns—Nicosia, Limassol, Paphos, Famagusta, Larnaca, and Kyrenia.

For a thousand years after the conquest of Cyprus by Egypt about 1450 B.C. the island was colonized by Greeks and Phoenicians. It was successively annexed by Assyria in the seventh century B.C., and by Egypt and Persia in the sixth century. About 500 B.C. the Greek cities joined Cyprus in a revolt against Persia. The island passed to Alexander the Great in 333 B.C. and to Rome in the first century B.C. Apostles Paul and Barnabas introduced Christianity here. The general prosperity of the island was lost through Arab raids in the seventh and eighth centuries, and through misrule by the Byzantines. In 1191 it was taken by Richard I, who sold it to the Knights Templars. They returned the island, and Richard sold it in 1192 to the French Crusader, Guy of Lusignan, whose family ruled Cyprus until 1475.

In 1489 it came under Venetian rule. Selim II expelled the Venetians in 1571 and Cyprus remained under Turkish rule until the 1878 Cyprus Convention. The agreement recognized the sovereignty of the sultan, but the administration of the island passed to the British. With the entry of Turkey into World War I in 1914 on the side of the Central Powers, Cyprus was annexed by Great Britain. The island gained the status of a crown colony on May 1, 1925, and the high commissioner became governor. Following disturbances rising from agitation for union with Greece, the legislative council, first established in 1882, was abolished in November 1931. The power to make laws was given to the governor with advice from an executive council. In April 1943 the British introduced municipal government on the basis of adult suffrage and proposed that Cyprus be offered self-government after World War II. The island served as a military and naval bastion for the British during World Wars I and II. The British maintained detention camps on Cyprus from 1946 to 1948 for Jewish immigrants entering Palestine illegally.

A consultative assembly was convened in November 1947 to offer proposals for constitutional reform and to consider the possibility of re-establishing a central legislature. A new constitution was presented by the British government in May 1948 for consideration by the assembly. At the instigation of the Greek Orthodox church and later the Communists, the Greek Cypriote members of the assembly resigned and the assembly was dissolved. Agitation for union with Greece, *enosis*, was renewed. A British attempt to instigate constitutional changes during 1954 failed. With the signing of an agreement between the British and Egyptian governments to withdraw from the Suez Canal in 1954, the strategic position of Cyprus was enhanced. In April 1955 Cypriote nationalists began committing acts of terrorism against the British government that increased in intensity after the exile of the leader of the *enosis* movement, Archbishop Makarios, early in 1956. In June 1956 a member of the U.S. consulate was killed in Nicosia by a terrorist bomb.

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CYPSELUS, tyrant of Corinth, 655?–625 B.C., established the policy of trade and colonization which brought prosperity to Corinth. He built a votive treasure house at Delphi and a statue to Zeus at Olympia.

CYRANO DE BERGERAC, SAVINIEN DE, 1620–55, French poet, dramatist, and soldier, who is remembered not so much for his own plays as for a play written about him. The real Cyrano, a swaggering, duel-fighting, free-thinking, undoubtedly talented man, has become almost completely submerged in the romanticized portrait of him in Edmund Rostand's play, *Cyrano de Bergerac* (1897), in which the hero is an intrepid soldier-poet, who believes that his monstrous nose renders hopeless his love for his cousin Roxane. José Ferrer played the title role in a motion picture (1950) based on Rostand's play.

CYRENAICA or **CIRENAICA,** province, E Libya; bounded by the Mediterranean Sea on the N, the provinces of Tripolitania and Fezzan on the W, French Equatorial Africa on the S, and Egypt and the Sudan on the E; area 330,173 sq. mi.; pop. (1954) 291,328. The people are concentrated along the coastal plain from Bengasi to Derna, and on the plateau of Gebel el Achdar adjacent to the coast. Only a minor segment of the population lives in oases in the Libyan Desert to the south. The most important oases are Cufra and Gialo. Most of the inhabitants are Arabs, but there are a few Berbers. About 99 per cent of the people are Moslems.

Economic Factors. The chief products of the coastal and plateau areas, where the average annual rainfall is about 16 inches, are wheat, barley, olives, and grapes. Dates are grown in the oases. Stock raising by the nomadic population in 1950 accounted for about 461,000 sheep, 379,000 goats, 33,000 cattle, 21,000 camels, and 50,000 horses, donkeys, and mules. There is sponge and tunny fishing off the coast. Industry includes the growing and processing of tobacco and olive oil, the dyeing and weaving of imported cotton yarn and local wool, and the manufacturing of matting, leather goods, carpets, and silver and gold embroidered fabrics. The principal towns are Bengasi (the capital), Barce (Barca), Derna, Tobruk, and Soluch. A rail line connects Soluch and Barce with Bengasi. Another extends east from Tobruk to Alexandria and Cairo, Egypt. A good highway connects the coastal settlements. The province has no permanent streams.

History. The coast of ancient Cyrenaica was settled by the Greeks during the seventh century B.C. (see CYRENE). It became subject to Egypt about 321 B.C. and flourished under the Ptolemies. The area was taken about 95 B.C. by the Romans, who combined it with Crete into a province about 30 years later. Cyrenaica was conquered by the Arabs in 643 and was part of a province of the Ottoman Empire from 1517 until 1912, when it became an Italian colony. After World War I Italian control extended inland, and in 1925 and 1934 some changes were made in the boundary with Egypt. Cyrenaica was a battleground during World War II, 1940–42. With the defeat of the Axis troops the area came under British administration in 1943. Cyrenaica was part of the kingdom of Libya established in December 1951. A wali (governor) was appointed by the king and an executive council and a legislative council were established in 1952. See LIBYA; WORLD WAR II.

CYRENAICISM, a school of Greek philosophy founded in the latter part of the fourth century B.C. by Aristippus of Cyrene, a pupil of Socrates. Cyrenaicism was a not entirely legitimate offshoot of Socratean ethics. That is, this school, the complement to that of the Cynics, emphasized one part of the ethical views of Socrates to the exclusion of the other. Aristippus taught that the chief pursuit of man is and ought to be a prudent personal pleasure; hence, in opposition to the Cynics (and Socrates), Aristippus denied that virtue had any intrinsic value. Further, all knowledge, since it is derived only from immediate sensation, is relative and subjective. See ARISTIPPUS OF CYRENE; CYNICISM; EPICUREANISM; SOCRATES.

CYRENE, an ancient Greek colony on the N coast of Africa, in present Cyrenaica, 8 miles SW of Apollonia. Cyrene was founded about 630 B.C. from Thera,

White façades along a narrow street in the Cyrenaican town of Derna reflect the afternoon sun. Now a part of Libya, the town is populated principally by Berbers and Arabs.
BRUNO STEFANI

Cyrene, the ancient Greek capital of Cyrenaica and once a center of learning, is the site of numerous ruins. The city passed to Rome in 96 B.C. and fell to the Arabs about 640.
BRUNO STEFANI

BOSTON MUS. OF FINE ARTS

The Head of Cyrus Brought to Queen Tomyris, a Seventeenth Century Painting by Rubens

and was populated by Theraeans and Cretans. The major Greek center on the North Africa coast, it prospered as a center of trade, medicine, and learning. The leader of the original colonists was called Battus, Libyan for king. His son Arcesilas succeeded him, and following monarchs were named Battus and Arcesilas alternately. This Battiad dynasty ended about the middle of the fifth century B.C. The city was for a time a part of the Persian Empire and submitted to Alexander in 332. It was a possession of the Ptolemies, and after 96 B.C. was governed by the Romans. Cyrene was a Jewish center by the time of Christ, and the scene of Jewish uprisings under Trajan, A.D. 115–116. By the sixth century it was largely a ruin. There are important archaeological excavations and a museum in the village at the site.

CYRIL, SAINT, 827–869, and **METHODIUS, SAINT,** 826–885, sons of a Thessalonican named Leo, were the great apostles of the Slavs in the ninth century, but are most noted for their Christianizing work among the Bohemians. Cyril, or Constantine, known as the philosopher, preached the gospel to the Khazars (but without great success; most of them adopted Judaism), and Methodius became abbot of a monastery in Constantinople. When the Bulgarian prince Boris requested a missionary to teach his people, the brothers were sent. They also preached in other Slavic countries, worked to give the Slavs an alphabet, and translated the Scriptures into Slavonic. It is difficult to dissociate their work, but Methodius lived and labored the longer, especially in Pannonia, and was consecrated bishop in 869. In 879 Methodius was called to Rome to justify his celebration of the Mass in the native tongue and there succeeded in winning the approval of Pope John VIII. Although Cyril created an alphabet, probably the Glagolitic, his name is also given to the Cyrillic alphabet, which he probably did not invent. Later popes stigmatized the brothers as Arians, but they were ultimately canonized. Their feast day is July 6.

CYRILLIC ALPHABET, named for St. Cyril of Thessalonica who supposedly invented it after the failure of his Moravian mission. Although its authorship is in doubt, the alphabet was devised for the use of Slavic-speaking peoples during Cyril's time (ninth century). It was based on Greek uncials, with added nasal and vowel sounds found in Slavic dialects, and consisted of 38 letters. Thoroughly adaptable and easily modified to the needs of the Slavic tongues, the alphabet continued to be used by Russians, Ukrainians, Bulgarians, and Serbs, in each case modified to fit the needs of the particular language. See Russian Language.

CYRILLUS, LUCARIS. See Lucaris, Cyril.

CYRIL OF ALEXANDRIA, SAINT, 376–444, one of the fathers of the church, succeeded his uncle as patriarch of Alexandria in 412. Intolerantly zealous, he closed the churches of the Novatians and expelled the Jews from the city in 415; he was also in some measure responsible for the murder of Hypatia. The latter part of Cyril's life was spent in controversy with Nestorius, against whom the Alexandrian synod hurled 12 anathemas in 430, and who was condemned by the council of Ephesus, 431. A man who in his furiously antiheretical zeal was sometimes highly unchristian in behavior, Cyril was at the same time a respected dogmatic theologian. Cyril's writing was as uncompromisingly forceful as he himself must have been. Among his extant works are *Thesaurus,* a treatise on the Trinity; *On the Right Way;* and *Twelve Anathematisms.* See Hypatia; Nestorian.

CYRIL OF JERUSALEM, SAINT, 315?–?386, doctor of the church, became bishop of Jerusalem about 348, succeeding Maximus. Controversy with his metropolitan, the Arian Acacius, led to his being exiled. A later synod restored him, but he was again deposed and banished by Emperor Valens. Cyril later returned to Jerusalem and participated in the second ecumenical council at Constantinople; there is some evidence that he took part in writing the Nicene Creed. Cyril's *Catechetical Lectures* are valuable for their elucidation of fourth century Christian dogma, especially on transubstantiation. His feast day is March 18.

CYRUS THE GREAT or **CYRUS THE ELDER,** 600?–529 B.C., king of Persia, 550–529 B.C., and founder of the Persian Empire. The story of Cyrus' birth and early youth has derived from legend; however, considerable information of historical value has been obtained from the writings of Herodotus and from Cyrus' own cuneiform cylinder, discovered in Babylonian ruins. Cyrus is shown to have been the son of Cambyses I, and a descendant of Achaemenes. In the Bible Cyrus is identified as a Persian; Isaiah

called him the anointed of the Lord. According to the cuneiform cylinder (in the British Museum) Cyrus was a subject of Astyages, king of the Medes, who may have been his grandfather. Aside from legend, it is known that by 550 B.C. Cyrus had led a force of Persians against Astyages and conquered the Median empire. Having united Media with Persia, Cyrus invaded Lydia, overwhelmed the army of Croesus, and captured the capital city of Sardis, 546 B.C. With Croesus out of the way, Cyrus gained control of most of Asia Minor. There was unrest in Babylon: King Nabonidus was unpopular with his subjects, and the Jews were held in the city. According to the cuneiform records and the Old Testament, Babylon fell without fighting and Nabonidus was captured. Cyrus made a triumphal entry into the city in October 539 B.C., and became king of Babylon. He liberated the Jews, permitted them to return to Palestine to rebuild Jerusalem, and even restored sacred vessels taken from their temple. With a great empire at his command Cyrus is said to have marched east of the Caspian Sea to conquer the Massagetae, a barbaric tribe, but was killed in battle.

CYRUS THE YOUNGER, 424?–401 B.C., Persian prince. The second son of King Darius II, he was sent to Asia Minor as satrap (governor of Persia) in 407 B.C. When his brother Artaxerxes II succeeded their father as king, 404 B.C., Cyrus conspired to overthrow him. Leaving Sardis, he led a horde of Asiatics and some 13,000 Greek mercenaries in a march on Babylonia in 401 B.C. When word of Cyrus' treachery reached the king, he sent an army against Cyrus. The two forces met at Cunaxa; Cyrus was killed and his army defeated. After the battle, Xenophon led the famous retreat of 10,000 Greeks, 401–399 B.C., described in his *Anabasis*.

CYST, a sac with one or more cavities containing fluid, semisolid material, or gas; or a capsule which surrounds some plant structures or lower animals in response to a need for protection. The sac type of cyst may be found in any part of the body of higher animals and humans and is usually an abnormal structure. It may be as small as the head of a pin or as large as a man's head. It develops most commonly as a result of the occlusion of a gland duct, preventing secretion of fluid; the gland swells in its attempt to hold the fluid and so becomes a cyst. Cysts may also form around foreign bodies, unerupted teeth, parasites, and accumulations of blood in the tissues. Occasionally cell changes may occur in the cyst, leading to the formation of a tumor (see TUMOR). Some types of cysts, particularly those affecting small glands in the skin, disappear spontaneously. Others require surgical removal, either by cutting away the entire structure or puncturing it for drainage.

Some protozoans enclose themselves in capsule-like cysts as a means of protection when the environment is not suited to them. *Endamoeba histolytica*, the protozoan causing amebiasis, is an example of such an animal (see DYSENTERY, *Amebic Dysentery and Amebiasis*). Some algae and bacteria also enclose themselves in a cyst during their resting spore stage. See SPORE.

CYSTIC FIBROSIS. See CELIAC DISEASE.

CYSTINE. See AMINO ACID.

CYSTITIS, inflammation of the urinary bladder. See KIDNEY, *Accessory Structures*.

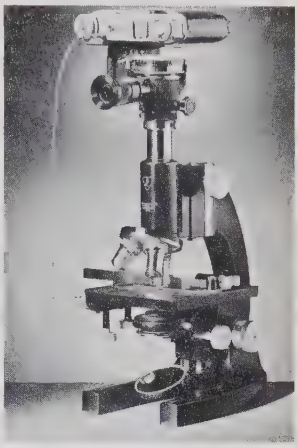
CYSTOIDEA, an extinct class of stemmed or stemless echinoderms of the Paleozoic era (see ECHINODERMATA; GEOLOGIC TIME). Cystoids had a boxlike, calcareous shell consisting of many small, close-fitting plates arranged with or without symmetry. The body, or calyx, was the largest part of the animal. At one end of the calyx was the mouth, covered by five small plates. The anus was located in a ventrolateral position and it, too, was covered by plates. In the same plane as the mouth and anus were two other openings. It is thought that one of these openings was a genital pore, the other a hydropore.

CYTHERA. See IONIAN ISLANDS.

CYTHNUS. See CYCLADES.

CYTISUS. See BROOM.

CYTOLOGY, the study of the structure, function, growth, and duplication of cells, the smallest units of life (see CELL). Because most cells are very small, microscopes with a high degree of magnification are required for the study of them. Cytological research has revealed much information on the functions of different parts of the cell, such as mitochondria; or the mechanics of cell duplication; the relation of chromosomes within the nucleus to heredity; the chemical and mechanical aspects of the union of sperm and egg; and the chemical nature of the various parts of the cell, especially the chromosomes. See HEREDITY; MICROSCOPE.



EASTMAN KODAK CO.
Microscope with Camera Attached

A number of instruments besides the ordinary microscope have proved valuable in extending the possibilities of cytological research. The development of the phase contrast microscope is particularly important in the study of living cells. Since living cells are very nearly transparent when viewed with the transmitted light of the ordinary microscope, their parts are difficult to distinguish and so most cytological study was formerly done on cells which were killed and stained. Because the different parts of the cell have different chemical properties, they possess different affinities to stains. It is possible therefore to use several stains on one cell to obtain a varicolored image which not only brings out the parts more clearly, but also gives an indication of the chemical nature of those parts. With such technique, however, a question always remained as to whether these stained, dead cells represent a true picture of the structure of active, living cells. The phase contrast microscope makes it possible to answer this question. This microscope obtains contrast through differences in the refractive index of the different parts of the cell (see LIGHT, Wave Motion, *Refraction*). The various parts of the cell stand out from one another because each bends the oblique light rays to a different degree. With this microscope it is possible to observe and photograph details of mitosis (see MITOSIS) and other cell processes which had previously been seen clearly only in stained preparations. The light interference microscope, a later development, causes different parts of the cell to appear in different colors in accordance with their optical density. It has been used for such valuable research as the measurement of the protein content of various parts of the cell, including that of such small cell structures as the nucleolus.

Much of the cytological research in cell function has been made possible through the use of delicate microdissection needles and pipettes. These instruments can actually be used on living cells being viewed under the microscope. They are controlled through rods which are moved by the hands of the viewer. Each movement of a rod is transferred to a greatly reduced movement of a needle under the microscope. Through the use of these instruments cells can be cut in two, the nucleus can be removed and even transferred to another cell, and individual chromosomes can be removed.

Cytogenetics. Since the chromosomes within the nucleus of the cell bear genes, which are responsible

for inherited characteristics, some phases of cytology are closely linked with the study of genetics and constitute another special field, cytogenetics. Cytogenetic plant studies have brought out a method of inducing a doubling of the chromosome number in the growing tips of many higher plants. When applied to plant tissue which is actively dividing, colchicine causes a temporary inhibition of mitosis (see COLCHICINE). In some of the inhibited cells, however, the chromosome number has already become duplicated in preparation for division, causing some cells to have double the normal chromosome number (tetraploid cells). When cell division is resumed, these cells give rise to more cells with this tetraploid chromosome number. Plant shoots which grow from such cells will generally be larger and will bear larger flowers and fruits. New commercial varieties of flowers and fruits have been produced by using colchicine to inhibit mitosis.

Cytogenetic studies of both plants and animals have been vitally concerned with the effects of high energy radiation on the chromosomes of cells. Mice, fruit flies, the spiderwort plant, *Tradescantia*, and other experimental organisms have been exposed to the radiation from test explosions of atom and hydrogen bombs. Cytological studies of the cells after exposure confirm what laboratory studies of the effects of radiation have revealed. There was widespread damage to the chromosomes when the organisms were close enough to receive heavy radiation; the chromosomes were often found to be broken, twisted, or rearranged in various abnormal patterns. Such damage, of course, plays havoc with heredity. Heavy damage results in complete sterility; lighter damage may allow reproduction, but makes abnormal offspring more likely because of the unbalance of genes caused by the broken chromosomes. A. M. WINCHESTER

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CYZICUS, ancient town of Asia Minor, at the base of Cyzicus or Kapidagi Peninsula, off the S shore of the Sea of Marmara. Cyzicus was a colony of Miletus founded traditionally in 756 B.C., and an important commercial center. Its coins were current throughout the Greek world. Cyzicus came under Persian control in the sixth and again in the fourth centuries B.C. and joined the Delian League at the beginning of the fifth century. The city was friendly to Rome, and withstood a siege by Mithridates in 74 B.C. It was damaged by earthquakes in the time of Justinian and was taken by the Arabs in 675.

CZAR, Russian *tsar*, a monarch, especially in Russia and other Slavic countries. Traditionally the title derived from Caesar. The Bulgarian rulers were called czars from the tenth and eleventh centuries, and Stephen Dushan of Serbia was crowned czar in 1346. The Russians called the Byzantine emperors and the Mongol khans czars. Occasionally their own rulers, Ivan III and his son Basil especially, were czars as well as grand dukes of Moscow. Ivan IV was crowned czar in 1547, and from his time the title was borne by the rulers of Russia, or claimed by pretenders, until the death of Nicholas II in 1917. After the conquest of Smolensk and Little Russia in the early eighteenth century, the Russian emperor was known as czar of all the Russias. The consort of the Russian czar was the czarina; his son, the czarevitch; the eldest son was the cesarevitch (*tsesarevich*); and a daughter, the czarevna.

The title czar was revived in Bulgaria for Ferdinand in 1908, and borne by the rulers of Bulgaria until 1946.

CZARTORYSKI, ADAM JERZY, PRINCE, 1770–1861, Polish general and leader in the Polish insurrection of 1830, was born in Warsaw. In the war against Russia, 1793, following the second partition of Poland, he was captured and taken as hostage to St. Petersburg, where he gained royal favor. Czartoryski was appointed ambassador to Sardinia and assistant to the minister of foreign affairs. But when the revolution of 1830 broke out, he supported his countrymen. Appointed president of the provisional government, and placed at the head of the national government, January 1831, he devoted half his property to public service. The revolt was crushed, and Czartoryski fled to Paris.

CZECH LANGUAGE AND LITERATURE. Czech, or Bohemian, belongs to the Western branch of the Slavonic languages. In Czech the verb has only two tenses but there are three genders and a complex syntax. Strong foreign influence is indicated by numerous Slavonic and German loan words. The history of Czech literature may be divided into three leading periods: from the beginning until the Hussite Wars, 1410; from the time of Huss to the latter part of the eighteenth century; and from the literary renascence of that period onward.

The earliest productions are religious in character, the Greek church being represented by a Glagolitic fragment (?900), the Latin by a fragment of St. John's Gospel with interlinear translation in the vernacular. The Bible was completely translated by the end of the fourteenth century. Also to the fourteenth century belong the chronicles named for Dalimil, although the real name of the author is unknown; *The Book of the Old Lord of Rosenberg* (*Kniha Starého Pána Roženberka*), one of the earliest specimens of Czech prose; the *Exposition of the Law*, by Andrew of Duba; and the work of Thomas of Štítný (who wrote on religious and moral topics), the great Czech author of that century.

John Huss, whose name signifies the beginning of the second period, did much to stabilize Czech orthography and to develop a native literature. Some of his writings are in Latin but he left a fair number in his own language. Peter Chelčický (1390–1460), a pupil of Huss, wrote the celebrated *Net of Faith* (*Síť Víry*). In 1487 the first regular printing press was set up in Prague, and the Bible was printed there in the following year. Some interesting volumes of travel were published. Daniel Adam of Veleslavin (1545–99) and Jan Blahoslav (1523–71) were typical of the Renaissance humanists. Hájek (1495–1553) wrote a curious chronicle, *Kronika Česká*, in which he incorporated all the early national legends. A narrative by Wenceslaus Vratislav of Mitrovitz tells of his captivity at Constantinople. Jan Amos Komenský (more familarly known by his Latin name, Comenius), exiled by the imperialists, wrote his *Didactica magna* (1632) in Poland.

Near the close of the eighteenth century a revival of Czech literature took place. It began with Josef Dobrovský (1753–1829), who wrote a grammar of Czech and a notable work on Old Slavonic. Josef Jungmann (1773–1847) compiled a valuable dictionary. Jan Kollár (1793–1852) and František Čelakovský (1799–1852), together with the balladist Karel Erben (1811–70), brought to Czech poetry such fire, pathos, and crystalline melody that the prose of the period seems wretched in comparison. František Palacký was the author of the great national history; other historians included Gindely, Tomek, Novotný, and Nejedlý.

The most notable of the post-romantic writers were the poet Vítězslav Hálek (1835–74) and the critic Jan Neruda (1834–91). The voluminous and versatile Jaroslav Vrchlický (1853–1912) was essentially a survivor of the romantic period. Tomáš G. Masaryk was one of the leaders of a realist reaction which produced the concise and bitter documents of the poet Josef Machar.

No twentieth century Czech writer won such international recognition as did the playwright Karel Čapek (1890–1938), who wrote *Krakatit* (1924). F. X. Šalda (1867–1937) achieved a European reputation as a critic, and Egon Hostovský and F. C. Weiskopf published successful novels. See HUSS, JOHN; COMENIUS; MASARYK, T. G.

CZECHOSLOVAKIA

This small Slavic country has excelled in both diversified industries and athletics.

CZECHOSLOVAKIA, or Československo, a republic of central Europe, bounded on the W by Germany, on the N by Germany and Poland, on the E by the U.S.S.R., on the S by Austria and Hungary; area 49,330 sq. mi., comprising Bohemia, Moravia, the Czech area of Silesia, and Slovakia; pop. (1950) 12,338,450. See map in Atlas, Vol. 20.

Physical Factors. The country is drained by the Elbe (Labe) and its tributary the Moldau (Vltava) and by the March (Morava), the Waag (Vah), and other tributaries of the Danube. Mountains forming a natural frontier enclose the northwestern border. Krkonoše in Bohemia reaches a height of 5200 feet and the High Tatra in Slovakia, 8000 feet. The lowlands are remarkable for their fertility. The climate is continental, with variations caused by topography.

Forests occupy nearly one-third of the total area of Czechoslovakia, making the country one of the most heavily wooded in Europe. Wolves, deer, and bears abound in the forested mountains. Other animals include foxes, squirrels, weasels, and skunks.

Social Factors. Czechoslovakia is a member of the Soviet bloc of nations. Despite the post-World War II spurt in the birth rate and its excess over the death rate, the population in 1955 was lower than in 1930. About 250,000 inhabitants, mostly Jews, were killed during World War II. Some 600,000 Sudeten Germans fled with the Nazi troops during their retreat from Czechoslovakia in 1945, and 2.4 million were expelled by the Czechs following the Potsdam Agreement. Some 730,000 inhabitants of Carpathian Ruthenia were lost to the U.S.S.R. when the Soviets annexed that province to the Ukraine in 1945.

The Czechs and Slovaks are for the most part Catholics but the Protestant minority, particularly among the Czechs, is much stronger than in other Slavic states. In 1954–55 about 73 per cent of the Czechoslovaks were Roman Catholics and about 13 per cent Protestants. The rest were Orthodox Christians, Jews, or atheists or agnostics. In 1949 all churches were put under state control. The concentration camps for priests and nuns that had developed under the Communists were reported to be abolished generally by 1955. Some of the inmates were released but not allowed to return to their callings.

Education is in the hands of the state according to the Education Act of April 1948 which established a uniform state system of education under the Communists. Soviet methods predominate in the schools, and the Russian language is foremost among the foreign languages taught. In 1948 there were 12 universities and technical colleges.

PRINCIPAL CITIES

	POPULATION 1930	1954 Est.
Prague (Praha)	2,035,000	2,100,000
Brno	1,041,000	980,000
Bratislava	769,000	945,000
Moravská Ostrava (Ostrava)	922,000	910,000
Nitra	684,000	700,000
Plzeň (Pilsen)	729,000	560,000
České Budějovice	652,000	525,000

CZECHOSLOVAK EMBASSY

A young bride and bridegroom of Moravia are dressed in the elaborately embroidered and lace-edged wedding finery customary in some areas of Moravian Czechoslovakia.

Economic Factors

Agriculture. The government declared in 1949 that the socialization of agriculture would be brought about through unified agricultural co-operatives. State farms were created and estates were limited to 124 acres. Under the first Five Year Plan, inaugurated in 1948, crop production was subordinated to livestock production. Agriculture was still to some extent in private hands in the early 1950s, although steps

Location Map of Czechoslovakia

Coat of Arms of Czechoslovakia

EASTFOTO

Mechanization replaces manual labor on Czechoslovak farms as a new combine speeds up the harvesting of sugar beets, one of the country's most important agricultural crops.

had been taken to hasten its socialization. The collective farms of Czechoslovakia held 33 per cent of the country's total arable land late in 1953, compared with 40.6 per cent at the end of 1952. For 1954 the Communist regime reported that the entire "socialist sector" (collective farms, state farms, and peasant co-operatives) of Czechoslovak agriculture held 44 per cent of the arable land. Agricultural production, however, lagged behind the needs of Czechoslovakia and Communist demands. In March 1955 the Prague government announced that while Czechoslovakia's industrial production had increased 102 per cent under the first Five Year Plan, agricultural production had grown only 13 per cent. In 1954 Czechoslovakia had to import 21 times as much wheat and 45 times as much butter as in 1937. Communist leaders urged Czechoslovak youth and other manpower to move from cities to farms to improve lagging food yields. Collective farms in 1956 had only 25.4 per cent of the farm land, state farms held 6.3 per cent, and the rest remained in private hands.

Some 60 per cent of the arable land is devoted to the production of wheat, rye, barley, oats, and corn. The country has abundant livestock, particularly cattle, horses, pigs, sheep, goats, and poultry. Forestry is important in the national economy.

Industry and Commerce. Czechoslovakia has well-developed and diversified industries. Mineral production includes both soft and hard coal, iron, graphite, silver, copper, lead, and rock salt. The chief coal fields are the Chomutov-Most area, Kladno, Falknov (Sokolov), Plzeň (Pilsen), and Moravská Ostrava. Lead is mined in Slovakia and rock salt in eastern Slovakia. The iron manufacturing, engineering, and agricultural machinery industries are outstanding. The Škoda plant in Plzeň is famous for heavy machinery and armaments. Almost all chemical products, especially tar, tar derivatives, and wood alcohol, are manufactured in Czechoslovakia. The production of building materials, china, and glass is extensive. The quality of Bohemian glass is renowned. The sugar beet production of Czechoslovakia is one of the largest in Europe. Malt and beer are important; Plzeň, especially is known for its high-quality brewing. The capacity of the textile industry is in excess of the country's requirements. Tanning, particularly for gloves and shoes, is highly developed. The nationalized Bata shoe factory in Gottwaldov (formerly Zlín) is widely known.

Nationalization of industry, planned in 1945, was implemented in 1948. The Five Year Plan enacted in 1948 emphasized industrial development beyond the prewar levels, particularly in the metallurgical industries. A state planning office was created in February 1949. By the end of 1949 some 97 per cent of the country's industrial capacity was nationalized. In 1954 Czechoslovakia was the world's eighth largest steel producer, ninth in pig iron, and eighth in coal. Coal production amounted to 63 million tons and steel to 5 million tons. Communist leaders, however, admitted grave deficiencies and inefficiencies in industry as well as in other branches of the economy. Early in 1956 the second Five Year Plan was announced to run parallel to and in co-operation with the sixth Five Year Plan of the U.S.S.R.

Trade with the Soviet bloc in 1953 was 79 per cent of Czechoslovakia's total foreign commerce. Following Soviet direction, Czechoslovakia by 1955 had developed its trade with the non-Communist countries as well, shipping arms to Egypt in exchange for cotton, trucks to the Near East and to South America, automobiles to Norway, Sweden, and Finland, and bicycles to various countries. Generally, Czechoslovakia's principal imports are raw wool and cotton, leaf tobacco, iron ore, and oilseed. The principal exports are steel rolling-mill products, sugar, sawmill products, and hollow glassware.

Before World War II Czechoslovakia attracted many tourists to its famous health resorts, including Karlovy Vary (Carlsbad), Mariánské Lázně (Marienbad), Františkovy Lázně, Jáchymov, and Pieštany.

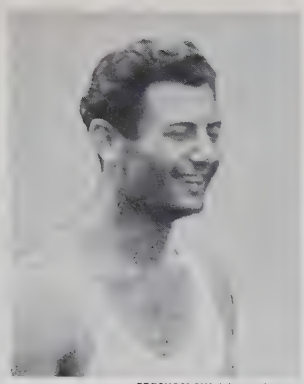
Transportation. Roads provide an adequate highway network, but less than half of the 44,000 miles of highways are surfaced. There are approximately 9000 miles of railroads. Railroads built from 1949 to 1956 included the lines from Havlíčkův Brod to Brno and from Rožňava to Turna. More than 80 per cent more goods was moved by rail and highway in 1953 than in 1948. Czechoslovakia has about 350 miles of inland waterways, consisting primarily of three river systems: the Elbe-Moldau, the upper Oder, and the middle Danube. They are not used to capacity. Airlines connect all major cities and link the nation with Moscow and other foreign points.

Administration and History

Government. The Communists who seized power in February 1948 wrote a new constitution for Czechoslovakia. Approved by the National Assembly in May 1948, the document proclaimed Czechoslovakia a people's democratic republic of two equal Slav nations, the Czechs and the Slovaks. Legislative power was promised to the National Assembly of one cham-

A Czech craftsman works upon a violin that some day may find its way into the hands of an artist in Prague's Czech Philharmonic, which develops some fine musical talents.

CZECHOSLOVAK EMBASSY

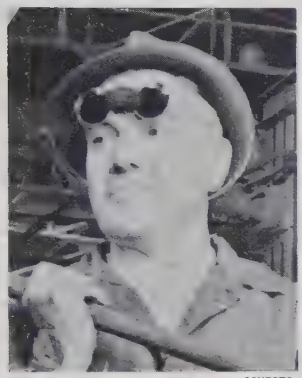


CZECHOSLOVAKIAN EMBASSY

Czech Athlete

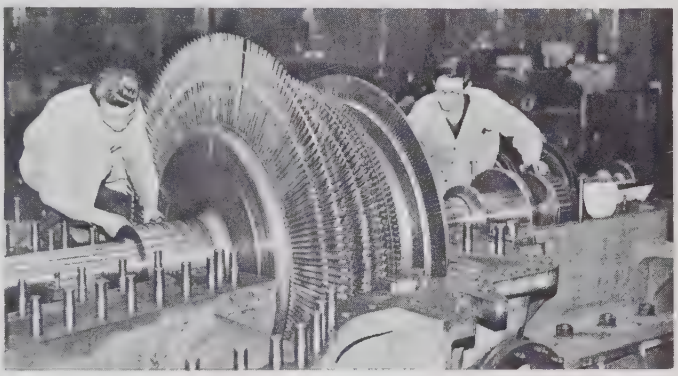
CZECHOSLOVAKIAN EMBASSY

Women Athletes on Parade During One of the Many Sports Festivals



SOVFOTO

Kladno Steelworker



CZECHOSLOVAKIAN EMBASSY

Men at Work in an Electric Turbine Manufacturing Plant at Brno

EASTFOTO

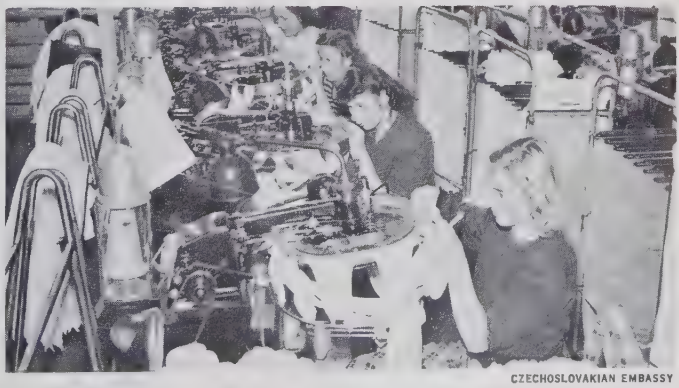
Slovak Farm Girl

EASTFOTO

Žatec State Pickers Harvesting Hops, Czechoslovakia's Green Gold

CZECHOSLOVAKIAN EMBASSY

Textile Worker



CZECHOSLOVAKIAN EMBASSY

Girls Intent on Their Work in a Gottwaldov Hosiery Factory

EASTFOTO

Students attend a lecture at Charles University in Prague. The oldest university in Central Europe, it was founded by charter of the Holy Roman Emperor Charles IV in 1348.

CZECHOSLOVAKIAN EMBASSY

The Hradčany, built in the ninth century at Prague, includes the ancient castle of the kings of Bohemia and the towers of St. Vitus Cathedral. The river is the Vltava.

ber and some 300 members elected for a 6-year term. Executive power was vested in the cabinet, appointed by the president of the republic. Slovak autonomy was limited to regional matters and subjected to the economic plans of the entire nation. Slovakia's own legislature was the Slovak National Council of 100 members, also with 6-year terms. By decree in December 1948 the provinces of Bohemia, Moravia, Silesia, and Slovakia were abolished and were replaced by 19 administrative regions. Only Communist candidates were offered in the elections for the National Assembly's deputies in November 1954. The elections, in which voting was compulsory, brought participation by 8,711,715 persons, or 99.19 per cent of the electorate. Of these, only 2.11 per cent voted against the Communist ticket. Hence Czechoslovakia is in reality ruled by a Communist party dictatorship.

Early History. The Czechs and Slovaks established themselves in their present home between the fifth and sixth centuries; in the seventh century they organized the first Slavic state. They accepted Christianity in the ninth century. The Slovaks soon came under the yoke of the Magyars (Hungarians), but the Czechs formed the powerful Bohemian kingdom that rose to great prominence during the Middle Ages. Under Charles IV they established in Prague the first university in central Europe (1348) and led the religious reform under John Huss (see Huss, John). They lost their independence in the battle of Bílá Hora (White Mountain) in 1620, coming under the rule of the Austrian Empire. The country was ravaged in the Thirty Years' War. Of 3 million Czechs, only 800,000 survived. The educated classes were expelled from the country for religious reasons, but throughout three centuries the national spirit was kept alive by sturdy peasants. By the end of the eighteenth century a national revival had taken place. It led to the demand for a separate Bohemian nationality within the Austrian Empire during the 1848 revolution. The move failed but Czech delegates won admission to the Austro-Hungarian parliament in 1879. By 1907 the Czech members, headed by Thomas Masaryk, began working for complete Czech independence. See Masaryk, Thomas Garrigue.

The Republic. During World War I the nation was so strong that, with the collapse of Austria-Hungary, Czechoslovakia shook off the yoke of the Hapsburgs, the German ruling family of the Austro-Hungarian Empire. Under the leadership of Masaryk and his co-workers, Dr. Eduard Beneš (see Beneš, Eduard) and Gen. Milan R. Stefanik, an independence movement was organized abroad in 1914, and the republic was proclaimed by Masaryk in Washington, D.C., on Oct. 18, 1918, and by the Czechoslovak National Committee in Prague on Oct. 28, 1919. It was confirmed by the treaties of Versailles, St. Germain, and Trianon. Masaryk became the first president. Futile opposition to union with Bohemia was made by Slovaks headed by Andrej Hlinka. Masaryk resigned in 1935 and was succeeded by Beneš. Under these two presidents Czechoslovakia became the most prosperous of all the states bordering on the Danube.

Czechoslovakia was the first non-Germanic nation subjugated by Adolf Hitler. Aided by his fifth-column minority of 2.3 million Germans who followed the Nazi leader Konrad Henlein, Hitler forced Czechoslovakia, through the Munich Pact of Sept. 29, 1938, to cede the Sudetenland border region to Germany.

Charles Bridge, dating from the era of one of Bohemia's greatest rulers, Charles IV, is among the most famous of the bridges that span the Vltava (Moldau) River at Prague.

CZECHOSLOVAK GOVT. INFORMATION SERVICE

Immediately Poland and Hungary annexed smaller border areas. (See MUNICH CONFERENCE.) Czechoslovakia lost one-fifth of its territory, and the population was reduced from 14,729,536 to 10,030,536. President Beneš resigned under duress on October 6 and was replaced by Dr. Emil Hácha on November 7. Hitler forced Slovakia to secede from the republic on Mar. 14, 1939, and German troops occupied Prague on March 15, declaring a protectorate over Bohemia and Moravia. Slovakia was established as an independent republic under German protection; the eastern tip of the republic, Carpathian Ruthenia (see TRANSCARPATHIAN REGION), was annexed by Hungary.

World War II. Deprived of their independence, the Czechs and Slovaks immediately started a new liberation movement abroad, led by Beneš and Jan Masaryk, son of the first president. During World War II they organized fighting units and reconstituted their army, first in Poland, France, and Great Britain and later in the Soviet Union. The Czechoslovak National Committee, headed by Beneš, who moved to London in July 1939, was soon recognized as the provisional government. The people in Czechoslovakia resisted the fierce German oppression by highly organized sabotage and a strong underground movement. In November 1939 the Germans closed all Czech institutions of higher learning for the duration of the war. Students and intellectuals were murdered by the thousands. The world was shocked in June 1942 when the Nazis obliterated the town of Lidice, killing the 200 male inhabitants, dragging the women into German slavery, and kidnaping the children. Between 1939 and 1945 some 500,000 patriots were sent to concentration camps and 700,000 workers were deported to Germany. Of 350,000 Jews only 40,000 survived. Among the distinguished victims of the concentration camps was the painter and poet Josef Čapek, brother of Karel Čapek (see ČAPEK, KAREL). The resistance movement culminated in the Slovak national uprising in 1944 and the Prague revolt during the last days of the war. The country was recaptured by U.S. armies in western Bohemia and Soviet armies in the east. The Czechoslovak government moved from London to Czechoslovakia by way of Moscow and established its first seat on home soil Apr. 5, 1945, at Košice, where an agreement was reached with the Slovaks constituting Slovakia a distinct nation within the republic. Czechoslovakia became one of the original members of the United Nations.

EASTFOTO

Slovak countrywomen in elaborate costumes inspect designs on eggs prepared for the Easter festival. Nearly 4 million Slovaks inhabit the eastern section of Czechoslovakia.

Worshipers attend services at a church in Prague in spite of repressive measures taken by the Communist-dominated Czech government. The chief religion is Roman Catholic.

UP

Rise of Communism. In May 1945 the government moved to Prague, where a provisional national assembly composed of 300 members—200 Czechs and 100 Slovaks—was formed on October 28. The assembly ratified the presidential decrees issued during the war and during the transition postwar period and confirmed Beneš as president. Its main task was to prepare for the election by secret ballot of the Constituent Assembly May 26, 1946. In the elections, which apparently were free and fair, the Communists won 40 per cent of the votes cast, and a coalition government was formed under Communist Klement Gottwald. During 1947 the Communist power increased. After gaining control of the ministry of interior and of the army, the Communists in a coup d'état assumed direction of the entire government in February 1948. An extensive program of nationalization was inaugurated and Czechoslovakia refused to participate in the European Recovery Plan sponsored by the United States. Communist control of the government was quickly consolidated. In foreign relations Czechoslovakia followed the policy of Soviet Russia.

On Mar. 10, 1948, the suicide of Jan Masaryk was announced. President Beneš resigned on June 7, and Gottwald succeeded him. The Communist police began a purge of parliament, political parties, press, and schools. In 1949 the conflict between the government and the Roman Catholic church became acute. A series of conspiracy trials was held. Harassment of priests by the Czech government continued in 1951, and Archbishop Jozef Beran was banished from his Prague diocese. In retaliation against Communist Czechoslovakia's actions, the United States in 1950 ordered the closing of the Czech consulates in Chicago and New York. When the Czech government imprisoned U.S. newspaperman William Oatis on espionage charges, the United States on July 31, 1951, canceled its tariff concessions to Czechoslovakia under the Geneva tariffs agreement.

In November 1952, in Prague, 14 former Communist leaders were tried on charges of Titoism (see TITO) and other treason to the Communist government. Among 11 sentenced to death and executed were Rudolf Slánský, former secretary-general of the

CZECHOSLOVAK EMBASSY

Women labor union members from Prague's industrial suburb of Žižkov parade on May Day, the traditional date for labor demonstrations since 1890 when it was first used in the agitation for the eight-hour day in Europe and the United States.

Czechoslovak Communist party, and Vladimír Clementis, former minister of Czechoslovakia's foreign affairs. The remaining three were sentenced to life imprisonment. As in the U.S.S.R. during this period, such persecution was aimed mainly at Jewish Communists. Further arrests were expected, but a respite occurred within the Soviet bloc after the death of Stalin on March 5, 1953, and in Czechoslovakia after the death of Gottwald on March 14 (see GOTTWALD, KLEMENT). Relaxation of some Communist policies at home and abroad was typified by the release on May 15 of William Oatis, who was allowed to return to the United States. The U.S. State Department on June 5 lifted the 1951 trade and travel restrictions against Czechoslovakia. In September 1953 a number of economic concessions to the Czechoslovak people were announced by the Prague government. Amnesties to certain categories of political prisoners were extended in 1953 and 1955.

Tensions reappeared, however, with such anti-Western moves as the Soviet-directed sale by Czechoslovakia of arms to Egypt in 1955. In February 1956 Prague protested against the continued sending of anti-Communist propaganda to Czechoslovakia via the Free Europe Committee's balloons. The decline of the deceased Stalin in Soviet favor caused confusion among Czech Communist leaders as well as in other Soviet satellite countries. See BOHEMIA; SLOVAKIA; AUSTRIA; AUSTRIA-HUNGARY; SLAVS; PRAGUE.

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CZEGLED. See CEGLÉD.

CZERNOWITZ. See CHERNOVTSY.

CZERNY, KARL, 1791–1857, Austrian piano teacher and composer, was born in Vienna. He studied piano in early childhood (including lessons with Beethoven in 1800–03) and became eminently popular as teacher and composer. Beethoven's undying faith in Czerny's genius was absurdly misplaced; nevertheless, more than 1000 of Czerny's compositions (many with more than 50 numbers) were printed during his lifetime, and much material remained unpublished at his death. Apart from his original compositions, many of which are considered mediocre, Czerny produced dozens of piano transcriptions (for 2, 4, and 8 hands) of orchestral and vocal works by other composers. His editions of certain of the keyboard works of Bach continued in use where other editions were not available (*The Art of the Fugue*); but the hundreds of technical studies (such as the famous School of Velocity) fell into increasing disuse after 1900. Among Czerny's more famous pupils was Franz Liszt.

CZESTOCHOWA, city, S central Poland, in the province of Kielce, situated on the Warta River, on the Warsaw-Kraków railroad; 128 miles SSW of Warsaw. A large steel mill is here. Paper, chemicals, and cotton and woolen cloth are also manufactured. Overlooking the city is the Pauline Monastery and Church of Jasna Góra (Shining Mount), one of Europe's most visited places of Christian pilgrimage. The church contains a picture of the Virgin alleged to have been painted by St. Luke. The monastery was founded by King Wladyslaw Jagiello in 1382. In 1655, when Charles X of Sweden invaded Poland, the successful defense of Jasna Góra by the prior Kordecki and a few soldiers through a 40-day siege was hailed as a miracle and served to rally the whole nation to stubborn resistance. The event is celebrated in Sienkiewicz's *The Deluge*. Pop. (1954) 145,000.

CZUCZOR, GERGELY, 1800–66, Hungarian poet and philologist, was born in Andod. He became a Benedictine monk in 1824, and taught at Raab and Komorn. In 1835 he became secretary of the Hungarian Academy, under whose auspices he edited four volumes of the great Hungarian lexicon (6 vols. 1861–74). His patriotic poems excited great enthusiasm and a collection of them was published in 1836. For the publication of the inflammatory poem *Riadó* (Call to Arms) in 1848 he was sentenced to six years' imprisonment. He also wrote a *Life of Washington* (1825).

D, the fourth letter in the Latin, Hebrew, Greek, and Phoenician alphabets, and in all alphabets derived from the Latin, such as English, German, Italian, and French. Corresponding to the Semitic *daleth* and the Greek *delta*, the form may have been adapted from the Egyptian hieroglyphic for *door*. In English, D represents a voiced dental corresponding to an unvoiced *T;* in some cases, as in *propped* and *trapped*, it becomes almost voiceless and reverts to the *T* sound.

In music, D (re) is the second note of the C-major scale. The key (tonality) of D-major has two sharps, the key of D-minor one flat.

In the Roman numeral system D stands for 500; a dash over the D (D) indicates that its value is increased tenfold. In mathematics *d* means diameter; in chemistry D stands for the element deuterium; in physics it represents density; in algebra it signifies the fourth known quantity. In the British monetary system *d* stands for *pence* (*6d* = sixpence).

DAB, any one of several flat fishes related to the flounder and found in the colder waters off both coasts of the United States and the coasts of Scandinavia. The American, or long rough dab, *Hippoglossides platessoides*, has a large mouth and a rounded tail, and is grayish brown above and white below. It is 12 to 24 inches in length and may weigh 14 pounds. The American dab, also called the Canadian plaice, is a bottom-dweller and is found from the tide line to depths of 2400 feet off the coast of Nova Scotia, New Brunswick, and Maine. This species eats diatoms, mollusks, crustaceans, and ascidians. From 30 to 60 thousand eggs are laid, and the young are hatched in 11 to 14 days. The females grow faster than the males and life expectancy for both is 24 to 30 years. The European dab, *Limanda limanda*, has smaller scales and a more pointed snout. *L. beanii* is a deep-water dab that is found down to 5000 feet.

DABCHICK. See GREBE.

DĄBROWA GÓRNICZA, Russian Dombrova, city, S central Poland, in the province of Katowice, (Stalinogrodzkie) 38 miles WNW of Kraków. The city is a railroad junction and has iron and zinc foundries and food processing industries. Extensive coal mines are in the vicinity. The city has been controlled at different times by Prussian, Russian, and Polish authorities. Pop. (1954) 40,200.

DACCA, city, E Pakistan, capital of the province of East Pakistan; on the Burhi Ganga River, 140 miles NE of Calcutta. The city was famous for its hand-woven Dacca muslin, now largely displaced by machine-woven fabric. Industries include the manufacture of glass, buttons, chemicals, matches, hosiery, jute matting, leather goods, and electrical goods. Dacca has a commercial airport and railroad shops. A seventeenth century mosque, a Mogul fort, and a large Hindu temple are located here. It is the site of the University of Dacca. The city was the Mogul capital of Bengal from 1608 to 1704. A French trading post was established here early in the eighteenth century. Dacca served as the capital of the British colonial province of Assam from 1905 to 1911. With the partition of India in 1947, Dacca became the capital of the Pakistani province of East Bengal. After reorganization in 1954 the city became the capital of East Pakistan. Pop. (1951) 273,159.

DACE, any one of several fresh-water minnows belonging to the carp family, *Cyprinidae*. Dace are used by fishermen as bait and some species provide attractive aquarium specimens. The horned dace, or creek chub, *Semotilus atromaculatus*, is found in waters from southern Canada to the Gulf of Mexico. It is 6 to 12 inches in length. The eastern redside dace, *Clinostomus vandoisulus*, about 4 inches long, is found in streams in southeastern United States. Other common species are the blacknose dace, *Rhinichthys atrotulus;* the longnose dace, *R. cataractae;* and the redbelly, genus *Chrosomus*.

DACHAU, town, Germany, Upper Bavaria, 10 miles NW of Munich, notorious as the location of a Nazi concentration camp. Constructed in the early days of Hitler's rule, the camp was originally intended for Germans suspected of opposition to his government. In 1938 and 1939 Austrian and Czech political prisoners were sent to Dachau when their countries were brought under German rule. During World War II civilian prisoners from the countries conquered by Germany were added. At one time this concentration camp housed 30,000 overcrowded, ill-fed, brutally treated prisoners. It was surrounded by two barbed wire fences, one of them electrified, with watchtowers 20 feet high at intervals of 50 yards. There were gas chambers for executions. The camp was taken and the prisoners liberated in a surprise attack by U.S. forces on Apr. 30, 1945, despite stubborn resistance. A statue was unveiled at the site of the camp in 1950, commemorating the victims of Dachau. See CONCENTRATION CAMP.

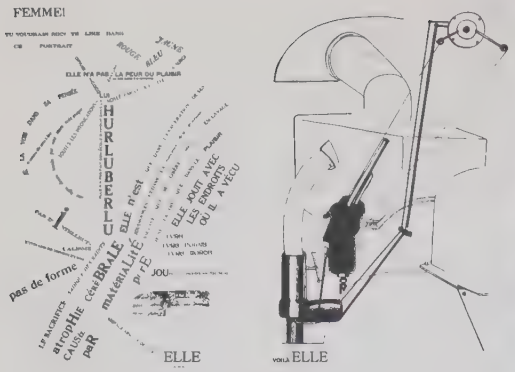
D'ACHE, CARAN. See POIRÉ, EMMANUEL.

Intelligent and affectionate, the smooth-haired dachshund has become one of the most popular breeds in the United States. It was originally bred for hunting in Germany.

DACHSHUND, a small, popular dog having very short legs, an abnormally long body, and a long, tapered head. The dachshund was used by medieval Europeans to hunt badgers, hence the German name dachshund, meaning badger dog. The animal varies in color from red to a combination of black and tan. There are three varieties of coats recognized—the long-haired, the wire-haired, and the smooth or short-haired dachshunds. The short-haired variety is the most popular in the United States because it is easy to groom and sheds very little. The standard dachshund weighs about 15 pounds; there is also a miniature variety bred in all three coats, with a normal weight of about seven pounds. The dachshund is a responsive, affectionate household pet and a persevering, courageous hunting dog.

DACIA, an ancient region N of the Danube River, approximately modern Rumania. The inhabitants were known sometimes as Dacians, sometimes as Getae. In the reign of Domitian, about A.D. 86–89, their king Decebalus threatened the Roman Empire and was only bought off by an annual payment. Trajan waged war with the Dacians, 101 to 106 (see TRAJAN) and made Dacia a Roman province. It remained part of the empire until about 274.

DACITE, a dense volcanic rock closely related to andesite (see ANDESITE). Dacite usually consists of white feldspar, black hornblende, and biotite crystals as the groundmass, into which larger quartz crystals,



Typical Example of Dadaism, by Francis Picabia

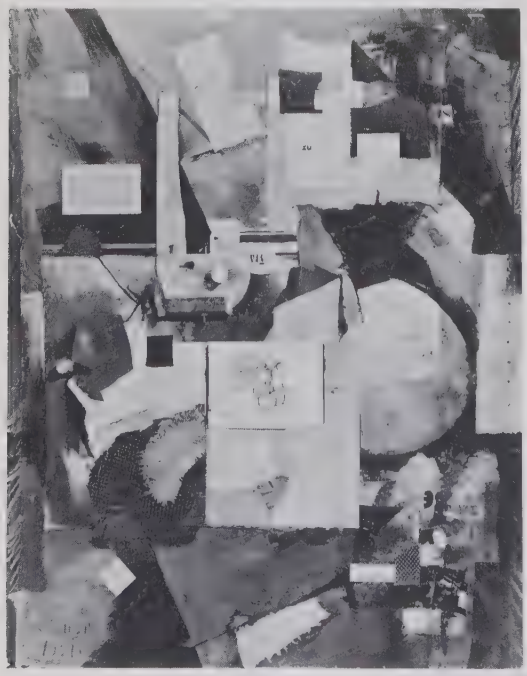
MUS. OF MODERN ART

M. Oppenheim's *Object*, Often Called the Furlined Teacup

known as phenocrysts, are embedded. The rock is found in the western United States.

DACRON. See FIBER.

DADAISM, a nihilistic movement among artists and writers during the years 1915–22. Perhaps the first conscious negation of the aesthetic principle in art, Dada developed in the period between cubism (from which it took for its own ends the technique of the collage) and surrealism (which grew out of Dadaism's preparatory negation of aesthetic principles). Dada was less an artistic movement than an intellectual revolt born of the disillusioning experience of World War I, and it carried the seeds of its own destruction. The geographical progress of the movement was from Zürich to Paris, New York, Germany, and finally to Paris again. Because Switzerland was a center of exile in the war years, it was natural that a rootless movement should have started there. Founders of Dada (whose name was picked from a randomly opened page of the dictionary—a method of selection which continued to characterize the group) included the Rumanian poet Tristan Tzara, the German writers Hugo Ball and Richard Hülsenbeck, and the Alsatian painter Hans Arp.



MUS. OF MODERN ART

Facetiously titled *Das Kirschbild* (The Cherry Picture) is this intriguing *gouache* and collage of fabric and paper on cardboard over wood, with pipe attached, by Schwitters.

In 1916 the group founded the Cabaret Voltaire, a combination literary club, gallery, and theater. Learned lectures on painting or Chinese philosophy alternated with scandalous demonstrations calculated to undermine all traditional authority. Most of the leading artists of the day, from Giorgio de Chirico to Pablo Picasso, exhibited at the gallery. Arp was the star performer with his free forms, art work born of fantasy and the unconscious. In America the precursor of Dada, Marchel Duchamp (whose *Nude Descending the Staircase* had already made him famous) was the central figure of the Dadaist revue *291*. Duchamp carried the nihilism of the moment to its logical conclusion by moving to America in 1915 and abandoning painting for chess. Dada in America was led by Duchamp's friends, Man Ray and Francis Picabia. In 1917 Picabia founded *391* at Barcelona, and in 1918 the *Dada Manifesto* was published at Zürich, outlining its full program of destructiveness. Dada was particularly successful in defeated Germany, where it took on strong political coloration. George Grosz and his satirical art were the major feature of German Dada (Grosz's association with Dada, which he regarded as nothing more than a joke, was brief—he went on to better things); in Cologne Max Ernst produced startling collages; in Hanover Kurt Schwitters, the painter, headed a movement allied with Dada, called *Merz*. By 1922 all the leaders were in Paris, but after a final summer demonstration the movement dissolved in an explosive divergence of opinion. The future leaders of surrealism had been in close touch with Dada, and surrealism soon arose from the ruins of traditional aesthetics left by Dada. Most of the more important figures in Dadaism looked upon it as a joke, made no less amusing by the fatuous seriousness with which critics later were to evaluate the "movement." See ABSTRACT ART; CUBISM; MODERN ART; SURREALISM.

ANTHONY KERRIGAN

DADDY LONGLEGS, also called harvestmen, a group of very long-legged, oval-bodied arachnids (see ARACHNIDA) belonging to the order Phalangida. About 2200 species inhabit North and South America and other temperate regions of the world. Fossil species are known from Pennsylvanian deposits (see GEOLOGIC TIME). The harvestman's abdomen is faintly segmented and fused to the cephalothorax. The legs are seven-jointed and delicate. Harvestmen feed on insects and the juice of soft fruits and vegetables. Their eggs are laid under stones and in crevices of wood. In northern areas most species overwinter in the egg stage; in warmer areas the adults overwinter.

DAEDALUS, in Greek legend, an Athenian regarded as the personification of the arts and handicrafts; also a figure in various myths about these subjects. He was forced to leave Athens because he had murdered his sister's son and his own pupil, went to Crete (where he made the famous wooden cow for

Pasiphae) and, after the birth of the Minotaur, constructed the fabulous labyrinth in which the monster was confined. This brought him into disfavor with Minos, so Daedalus made wings for himself and his son Icarus with which to fly to Italy. Icarus flew too near the sun and the wax which held the wings melted, causing him to fall into the sea; Daedalus completed the trip. From Italy he went to Sicily, and thence to Sardinia. Daedalus was fabled as inventor of the axe, the saw, the auger, the gimlet, and glue. As a sculptor, he was said to have been the first to give lifelike action to statues.

DAET, town, Philippine Islands, SE Luzon, capital of the province of Camarines Norte; 130 miles ESE of Manila. Daet is an agricultural trade center on the main coastal highway. There are gold and chromite mines in the area and ruins of a Spanish fort. Pop. 19,880.

DAFFODIL, a popular bulbous plant bearing yellow flowers about 2 inches long. There are many varieties of daffodil, *Narcissus pseudo-narcissus*, each differing in the size, shape, and coloring of its flowers (see NARCISSUS). The daffodil grows to a height of 12 to 18 inches; its leaves are about 15 inches long and three-fourths of an inch wide.

L. P. WATSON

Popular North American garden flowers of the amaryllis family, daffodil varieties number into the hundreds. The flowers are also well adapted to indoor pot culture.

DAGENHAM, municipal borough, SE England, in Essex; on the Thames River; 6 miles E of London. Industry includes the manufacture of automobiles, chemicals, electrical goods, knit goods, paint, pharmaceuticals and tile. Dagenham experienced a large growth after the establishment of the Ford Motor Company plant here in 1929. Pop. (1951) 114,588.

DAGESTAN AUTONOMOUS SOVIET SOCIALIST REPUBLIC or **DAGHESTAN,** SW U.S.S.R., in the Russian Soviet Federated Socialist Republic, bounded by Grozny Region on the N, the Caspian Sea on the E, Azerbaijan on the S, and Georgia on the W; area 14,700 sq. mi.; pop. about 1 million. Dagestan was absorbed into Russia during the nineteenth century; it became a Soviet autonomous republic in 1921 (see CHECHENO-INGUSHETIA). With the exception of a narrow coastal strip along the Caspian Sea, the republic is mountainous. It is drained by many mountain streams, the largest of which are the Terek, the Sulak, and the Samur rivers. The streams, especially the Sulak, are potential sources of hydroelectric power and irrigation. The climate is the Mediterranean type, modified in the mountainous area. Agriculture is restricted to the foothills, the mountain valleys, and the coastal plain. The principal economy in the mountains is the raising of livestock. In the foothills there are irrigated orchards and vineyards. The coastal plain produces cotton, corn, and winter wheat by irrigation and spring wheat and barley by dry farming methods. Fishing is important along the coast, particularly north of Makhachkala. Lopatin is the chief fishing center. Other industries include fruit canning, cotton and flour milling, wine and glass making, and chemical, metalware, and aircraft manufacturing. Makhachkala, the capital and principal commercial city, is an important petroleum refining center. Other cities are Buinaksk, Derbent, and Khasavyurt. The region is rich in minerals, with extensive deposits of petroleum, natural gas, and sulfur. Oil wells are located on the lowland between Makhachkala and Derbent. Izberbash is the main petroleum center. See CAUCASUS.

DAGGAFONTEIN, mining center, E Union of South Africa, in the province of Transvaal, in the East Rand gold fields, 27 miles ESE of Johannesburg. Daggafontein has one of the principal producing gold mines of the area and a uranium concentrate plant that extracts uranium from gold bearing ores.

DAGGER, a short, pointed weapon, usually with a flat triangular blade and cylindrical grip, primarily used for stabbing. The earliest forms were of flint, bone, or horn. Ancient daggers were also of copper, iron, and bronze, often richly decorated; a few specimens of solid gold and silver have been found. Daggers were frequently used in duels as a second weapon, primarily for the purpose of parrying the opponent's sword.

METROPOLITAN MUS. OF ART

Reproductions of Inlaid Mycenaean Daggers, 1600–1100 B.C.

DAGHESTAN. See DAGESTAN AUTONOMOUS SOVIET SOCIALIST REPUBLIC.

DAGO. See KHIUMA.

DAGOBERT I, 602?–639, the son of Clotaire II, king of the Franks. He became king of Austrasia, 622, succeeded his father in 628, and completed the unification, started by Clotaire II, of all the kingdoms of the Franks. A patron of the arts, he maintained a lavish court in Paris, created numerous monasteries, and established the first written laws for the barbaric tribes of his empire. After his death the Merovingian kings were dominated by the mayors of the palace.

DAGOBERT II, king of Austrasia, 673–679.

DAGOBERT III, king of Neustria, 711–715.

DAGON, in the Old Testament, a deity worshiped by the Philistines. He had temples at Gaza (Judges 16:23 ff.) and Ashdod (I Sam. 5:1 ff.), and seems to have been represented as a fish (Heb. *dag*), but with human face and hands (I Sam. 5:4), and even feet, according to some sources. Some investigators maintain that Dagon was not a fish god but rather the god of agriculture (specifically of grain), derived from the Assyro-Babylonian Bel (see I Sam. 6:4).

DAGUERRE, LOUIS JACQUES MANDÉ, 1789–1851, French painter and inventor of the daguerreotype, was born in Cormeilles, Seine-et-Oise. A painter of panoramas, Daguerre (with

METROPOLITAN MUS. OF ART
Daguerreotype—of Mrs. Harriet Beecher Stowe

Charles Marie Bouton) founded the Diorama theater in Paris, 1822. In 1829 he became interested in developing a process with which to reproduce his dioramas. With Joseph Nicéphore Nièpce, who had been working on the same idea since 1814, Daguerre invented a process of reproducing a picture on metal, the forerunner of photography. Nièpce died before the experiments were completed, but Daguerre announced the discovery in 1839. He was rewarded with a pension and membership in the Legion of Honor.

DAGUERREOTYPE, an early photographic process and the picture produced by this method. They were named for Louis Daguerre, their inventor. The process used a plate of polished silver sensitized by exposure to iodine vapor, which formed a coating of silver iodide. This plate was put into a camera and given an exposure of three or four minutes; it was developed by holding it in mercury vapor, which condensed in largest amounts on the parts of the plate that had received the most light from the object photographed. Thus the bright parts of the object were represented on the developed plate by layers of mercury that reflected considerable light and so appeared bright also. Daguerre at first fixed the plate by washing in a solution of common salt, but later found that sodium thiosulfate was better. The process was made public in 1839 and immediately became very popular. It was later improved by using both bromine and iodine to sensitize the plate and made less expensive by using silver-coated copper plates. See DAGUERRE, LOUIS JACQUES MANDÉ; PHOTOGRAPHY.

DAGUPAN, town, Philippine Islands, NE Luzon, in the province of Pangasinan; on the S shore of Lingayen Gulf; 100 miles NNE of Manila. Dagupan is a port on a branch of the Agno River. It is a trade center for the area's production of corn, copra, rice, salt, sugar, and a distilled alcoholic drink made from the nipa palm. The town is connected with Manila by rail and road. Pop. 43,838.

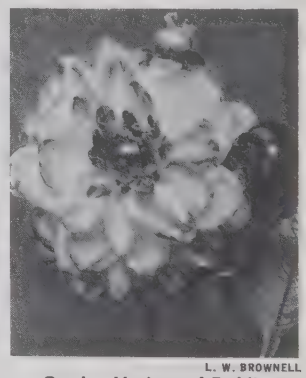
DAHABIYEH or **DAHABEAH,** a passenger boat used on the Nile River. The boats resembled the barges of the Pharaohs and were much used by Moslem rulers and men of importance in Egypt, and by travelers in the eighteenth and nineteenth centuries.

DAHLAK ARCHIPELAGO, a group of islands in the Red Sea, N Ethiopia; 30 miles E of Massaua, Eritrea; area 420 sq. mi.; pop. 2000. The archipelago consists of two large islands, Dahlak (290 sq. mi.) and Nora (50 sq. mi.), and 124 flat desert islets. Pearl fishing is carried on in the area. There are stone quarries on the island of Nora.

DAHLGREN, JOHN ADOLPHUS BERNARD, 1809–70, U.S. naval officer, was born in Philadelphia. He entered the U.S. Navy as acting midshipman in 1826 and was appointed midshipman six years later. An outstanding mathematician, he served with the U.S. Coast Survey, 1834–38, and after 1849 was assigned to the Bureau of Ordnance. He became an authority on naval armament and invented several important new weapons, including the powerful "Dahlgren," an 11-inch shell-firing gun which revolutionized naval armament. During the Civil War he was commandant of the Washington Yard, 1861, headed the Bureau of Ordnance, 1862, and as a rear admiral commanded the South Atlantic blockade squadron after 1863. He assisted General Sherman's land forces in the capture of Savannah, 1864, and entered Charleston the following year. After the war he again headed the Bureau of Ordnance, 1868–70. He wrote *Shells and Shell Guns* (1856) and other works. E. B. LONG

DAHLIA, a genus of 18 species of stout, glabrous or pubescent Mexican and Central American herbs belonging to the sunflower family, *Compositae* (see COMPOSITAE). The stems, which are usually erect, are sometimes woody at the base and branched below, and are called canes if they persist after the leaves have fallen off. The roots are tuberous or fibrous and, in one species, nearly as long as the stems. The leaves are opposite and pinnately divided and may be slender or ovoid; occasionally they are simple. The flower heads are long-stalked and large, ranging from 3 inches in diameter in wild species to 9 inches in cultivated forms. They are composed of a yellow, or sometimes purple, disk and a single series of ray-florets which are either white, purple, yellow, orange, or scarlet.

The genus as a whole is divided into three well defined sections: tree dahlias, the epiphytic dahlia, and annual species. Tree dahlias, cultivated especially in the Southwest, are coarse plants often 20 feet or more in height, with woody, partly hollow, canelike stems cross-partitioned at the nodes. They have fibrous roots and large decompound leaves often 3 feet long. The candelabra dahlia, *Dahlia imperialis*, has a single, nodding or drooping, bell-shaped flower head measuring up to 7 inches across. The tree dahlia, *D. excelsa*, and Lehmann's dahlia, *D. lehmanni*, ranging from Mexico to Colombia, have flower heads pointing upward and outward.



L. W. BROWNELL
Garden Variety of Dahlia

Macdougall's dahlia, *D. macdougallii*, discovered about 1936 in a forest at an elevation of 7000 to 7500 feet in southern Mexico, is the only known epiphytic dahlia (see EPIPHYTE). The plants may reach a height of 75 feet, half of which is represented by solid, woody stems about 2 inches thick, the other half by roots extending to the ground. The white flower heads appear at the top of the trees supporting the dahlia.

Annual species, which may be tall or dwarf, erect or procumbent, bear pinnate leaves smaller than those of the tree dahlias. The best-known and most variable member of this group is the Aztec dahlia, *D. pinnata*, which may be 6 feet high or more, es-

pecially in cultivation. This species and the tree dahlias were cultivated for centuries by the inhabitants of Mexico and Guatemala before they were introduced into Europe in 1789. They were known by the native names *acocotli* (watercane) and cocoxochitl (caneflower). All of the more than 14,000 known cultivated forms have been derived from a few introduced species, principally *D. pinnata* and *D. coccinea*. A single freak plant, *D. juarezii*, of Mexican origin, flowered for the first time in Europe in 1864 and became the progenitor of the cactus dahlias. The cultivated forms of dahlia are placed in classes according to height, stature, nature, and size of the heads. These classes include anemone-flowered, collarette, peony-flowered, formal decorative, informal decorative, show, pompon, cactus, semi-cactus, and star. The cane of the larger species of dahlias are used for making fences. The watery juice found in the vertical chambers of the cross-partitioned stems of *D. lehmanni* serves as a beverage. THEODOR JUST

DAHLMANN, FRIEDRICH CHRISTOPH, 1785–1860, German historian and political leader, was born in Wismar. He was professor at the universities of Kiel, Göttingen, and Bonn from 1812 until 1842, and published *Quellenkunde der deutschen Geschichte* (1830), a valuable guide to German history. Dahlmann was one of the members of the Frankfurt Assembly which offered the crown to King Frederick William IV of Prussia in 1849.

DAHLONEGA, city, N central Georgia, county seat of Lumpkin County, on U.S. Highway 19; 55 miles NNE of Atlanta. Situated in the heart of the Dahlonega gold field, the city was the site of a U.S. Mint from 1836 to 1861. Dahlonega is a trading center; small quantities of gold are mined. It is the site of North Georgia College. Pop. (1950) 2152.

DAHLSTIERNA, GUNNO EURELIUS, 1661–1709, Swedish author of patriotic verse, was born in Öhr, Dalsland. He wrote *Kungaskald* (1697), an elegy on the death of King Charles XI, and *The Goth's Battle Song, concerning the King and Master Peter* (1701), a spirited ballad of defiance of the Russians.

DAHN, FELIX, full name Julius Sophus Felix Dahn, 1834–1912, German historian, legal scholar, and poet, was born in Hamburg. After studying history and law at the universities of Munich and Berlin he served as professor of law at Munich, 1862; Würzburg, 1863; Königsberg, 1872; and at Breslau after 1887. His most important historical works are *Die Könige der Germanen* (The Kings of the Germans, 1861–1911) and *Urgeschichte der germanischen und romanischen Völker* (Primitive History of the Germanic and Romance Peoples, 1881–90). Dahn is also known for his *Die Vernunft im Recht* (Reason in Law, 1879). His poetry includes *Gedichte* (1857) and *Balladen und Lieder* (1878). He also wrote some 20 historical novels, numerous plays, and his memoirs, *Erinnerungen* (1890–95).

DAHOMEY, W Africa, a colony of French West Africa, bounded on the N by the Niger River, on the E by Nigeria, on the S by the Gulf of Guinea, and on the W by Togoland; area 44,710 sq. mi.; pop. (1953) 1,575,000. See map in Atlas, Vol. 20.

The climate is moist and hot, particularly along the low sandy coast where the average temperature is about 80°F. There are four more or less marked seasons: a long dry one from the beginning of December to the middle of March; a long wet one from the middle of March to the middle of July; a short dry one from the middle of July to the middle of September; and a short wet one from the middle of September to the beginning of December. The inland area is somewhat higher and has only two seasons: a dry one from November to March and a wet one from March to November. The coast line is about 70 miles long. The coast is flat, having numerous lagoons, swamps, and sandy wastes. North of this area the land gradually rises to about 1500 feet in the Atakora Mountains in the northwest. There are forests in the south and savannas in the north. The region, drained by the Ouémé and the Niger rivers, has tropical red soils.

The economy is largely based on agriculture. The forests contain oil palms, from which the chief exports, palm kernels and palm oil, are extracted. Cotton, peanuts, coffee, shea nuts, copra, and fish are also exported. Corn, guinea-corn, cassava, yams, plantains, and fruits are cultivated for domestic consumption. Livestock is raised in the north. There are undeveloped tin reserves. The principal imports are machinery, cotton goods, tobacco, and petroleum.

Porto-Novo, the capital, is the largest city. The leading port and religious center is Cotonou. The main railroad extends west from Porto-Novo to Cotonou and then north to Parakou. Other railroads link coastal areas and have branches to the interior. There are 3228 miles of highways, of which 871 are paved. There are approximately 2000 miles of telephone and telegraph lines in the colony. The Mano and the Zon rivers afford transportation and communications.

The inhabitants are Negroes, chiefly of the Fon branch of the Ewe tribe. The Ewes and the Yoruba of the southeast are known for their wood sculpture and cloth appliqué. Their society was based on a feudalistic system in which craft guilds were highly developed. Christian missionaries have converted some of the inhabitants, but animism is still predominant except in the north, where the people are largely Moslem.

Moorish geographers had knowledge of the Dahomey kingdom as early as 1500. The kingdom, with its capital at Abomey, reached its peak of power under King Gheso (1818–58). His and the armies of earlier kings were renowned for their Amazons or women soldiers. French conquest of Dahomey began in 1894, but the people resisted French rule until 1904 when the area was made part of French West Africa. In 1946, with the rest of French West Africa, Dahomey became part of the French Union.

DAIBUTSU, great image of Buddha, in Japan. See BUDDHA; KAMAKURA; KOBE; KYOTO; NARA.

DAIL EIREANN (Irish Diet), the national assembly of Ireland (Eire), first organized as a revolutionary body on Jan. 21, 1919, by the Sinn Fein leaders who had been elected to the British parliament in the general elections held a month before. The Dail held several other meetings during the period of revolutionary disturbances. When the Irish Free State was established in 1922 as a dominion in the British Commonwealth of Nations the Dail Eireann was organized as the lower house of the Irish parliament.

DAIMLER, GOTTLIEB, 1834–1900, was born in Württemberg, Germany. The inventor of a small high-speed internal combustion engine, 1887, he formed a company to manufacture the Mercedes automobile in 1890.

DAIMYO, feudal barons of Japan. See JAPAN, History.

DAINGERFIELD, ELLIOTT, 1859–1932, U.S. painter, was born in Harpers Ferry, Va., (now West Virginia). In 1880 he went to New York, where he studied under Walter Satterlee and later became associated with George Inness. Daingerfield's work is of interest chiefly for its coloring, such as in *The Waters of Oblivion*, *Madonna and Child*, and *Slumbering Fog;* he was also a muralist. He wrote the monographs *George Inness* (1911) and *R. A. Blakelock* (1914).

DAIREN, Russian Dalny, Chinese Talien, seaport, China, S Manchuria, in the province of Liaoning, at the S tip of Liaotung Peninsula, on Talien Bay, an inlet of Korea Bay of the Yellow Sea, at the S terminus of the South Manchuria Railway; 22 miles ENE of Port Arthur and 220 miles SSW of Mukden. The port of Dairen is one of China's leading export centers, especially for soybean products, coal, and grain. Machinery and chemicals are manufactured, and there are glass, cement, ceramics,

foundry, textile, and soybean processing industries. Dairen has extensive shipyards, railroad shops, and oil refineries.

Modern Dairen was largely built by the Japanese. It is a well planned city, with electric lighting, tramways, modern communications systems, wide thoroughfares, parks, cultural clubs, theaters, swimming pools, and a sports stadium accommodating 50,000 persons. The harbor was developed by Japanese engineers, who provided docks, piers, warehouses, floating cranes, ship repair yards, and breakwaters protecting 2500 acres of water area. A large research laboratory for perfecting the uses of agricultural products (especially of soybeans), glass and ceramics factories, and many other industries were first established by the Japanese. Electric and bus lines connect Dairen with Port Arthur and adjacent Liaotung Peninsula beaches and towns. Dairen is the seat of the Dairen Medical College and the Dairen Engineering Institute, founded in 1949. The latter has departments of machine building, shipbuilding, and chemical and civil engineering.

Russia leased the peninsula from China in 1898, intending to transform the small Chinese fishing village of Tailen into a commercial free port and port terminus of the South Manchuria Railway. In 1901, the Russians opened it as Dalny. By the Treaty of Portsmouth, which ended the Russo-Japanese War in 1905, the port was transferred to Japan on a 99-year lease. The Japanese reopened it in 1906 as a free port, and adopted the name Dairen. Following the invasion of Manchuria in 1931, complete Japanese possession of the port was assured. After World War II, under the Sino-Soviet treaty of Aug. 14, 1945, the U.S.S.R. recognized Chinese sovereignty in Manchuria. China was granted administrative rights over Dairen as an international free port (with the interests of the Soviet government safeguarded), and nearby Port Arthur was declared a joint U.S.S.R. and Chinese naval base for 30 years. The Sino-Soviet treaty of February 1950 provided for the transfer of Port Arthur to China immediately after a peace treaty with Japan, or not later than 1952. Dairen's position was to be considered later. The U.S.S.R. continued to exert military authority in Dairen, while China planned extensive development of the city as a key center in the economic progress of Manchuria and northern China. By a Soviet-Chinese declaration of October 1954 the Port Arthur Naval Base Area, which included the port of Dairen, was turned over to China on June 1, 1955. Under another agreement of 1955, the Sino-Soviet Shipbuilding Company in Dairen was transferred to China. (See MANCHURIA; PORT ARTHUR.) Pop. (1955 est.) 700,000.

One of the busy transportation centers in the Far East is this passenger pavilion at the wharves in Dairen, chief Manchurian seaport, formerly held by Japan and the U.S.S.R.

PAUL'S PHOTOS

NATL. DAIRY COUNCIL

DAIRY INDUSTRY

Biggest agricultural industry supplies milk, butter, cheese, and other nutritious foods.

DAIRY INDUSTRY. The dairy industry is composed of a wide variety of interlocking activities ranging from milk production on the farm to the delivery and sale of the final products to consumers. About one out of every 15 families in the United States depends upon the dairy industry for a living. More than 50 different kinds of products are made from milk, and about 20 cents out of every dollar spent for food by city families is used to buy milk, butter, cheese, and other dairy products. Milk from cows accounts for almost all of the milk produced and consumed in the United States, but about 10 per cent of the world's milk is obtained from other animals, such as goats, sheep, buffaloes, camels, and reindeer.

Dairy farming is the largest single branch of agriculture in the United States and is the source of almost one-fifth of total farm income. About 123.5 billion pounds of milk were produced in the United States in 1955. More than 3 million farmers kept at least one cow each for milking, and about 2 million sold milk or cream commercially. Until recent years most farmers kept some cows to supply home needs for milk, provide fertilizer, and obtain some cash income, but the number has declined drastically since World War II because of the great amount of labor required, stricter public health regulations in milk handling, and the better distribution of milk in rural areas. Dairy production has become more specialized and concentrated in larger enterprises as dairying methods and equipment have been improved.

History. Dairying in the United States began with the early English colonists, and it is known that cattle were landed at Jamestown, Va., in 1611 and at Plymouth, Mass., in 1624. The cattle of the colonial period were of the kinds and breeds found in the countries from which they were imported, the same animals supplying the work stock and meat as well as milk, butter, and cheese. The production of milk and other dairy products was incidental to the regular farm and home activities and the products were either consumed at home or sold nearby. Many families in towns and villages kept a cow to supply their own needs, and women in the towns as well as on farms made butter at home for the family. There were no factories for making butter or cheese. Cows calved in the spring, were milked during the pasture season, and were allowed to go dry for the winter. They subsisted mainly on pasture throughout the summer and had only roughage and other coarse feeds in winter. As late as 1800, residents of New York City milked

their own cows or bought milk from a neighbor, but later vendors carrying milk pails sold milk through the streets of the city. Cows were crowded in dirty barns and were fed refuse from breweries. The first shipment of milk by train into New York City was in 1842, and in five years farmers were shipping 50,000 quarts of milk daily. The growth of urban centers along the Atlantic Coast created a growing demand for milk, cream, butter, and cheese produced on farms, and several cities soon passed milk inspection laws. Thus, in the middle of the nineteenth century, the dairy industry began to take its present form of commercial production. Many animals were imported from Europe, where great progress had been made in developing milk-producing breeds. The first cheese factory in the United States was started in 1851 by Jesse Williams, a farmer living near Rome, N.Y., and similar factories sprang up in large numbers. The growth of cities, scientific and technical developments, and the usefulness of cows on the farm were factors in the rapid growth of the dairy industry.

Dairy Farming

Dairy Cattle. There are five major breeds of dairy cattle in the United States: Holstein-Friesian, Jersey, Guernsey, Ayrshire, and Brown Swiss. There are also several dual-purpose breeds that are kept for both beef and milk production. These include the Red Polled, Devon, and the milking Shorthorn breeds. (See Cattle, Dairy Cattle.) The Holstein-Friesian, popularly known as the Holstein, is the most numerous in the United States, being especially favored for large dairy herds. The Jersey cow, the second most popular dairy breed, is desired for its ability to make good use of grass and because its milk is high in butterfat content. The Guernsey produces milk and cream of a characteristically golden color that often brings a premium above the standard market price. Both Ayrshire and the Brown Swiss are rugged dairy animals that subsist well under poor forage conditions.

Kinds of Dairying. Farmers kept about 23.5 million head of dairy cattle in 1955, the number having declined after 1945 when there were 27.8 million head. Despite this decline in numbers, milk production has increased because of the improvement of stock and farming methods, especially on the larger commercial farms. On most commercial dairy farms, the size of the herd is adjusted to the amount of hay and pasture that can be produced. It is usually most profitable to keep just enough cows to utilize all the pasture so that little roughage need be purchased. However, if a farmer has the buildings, labor, and equipment to maintain the extra animals, he may keep more cows and buy additional hay even if the farm is too small to furnish all the roughage.

As a sideline enterprise to be operated along with some other form of agriculture, the farmer must keep at least 10 cows in order to make efficient use of a milking machine and cattle housing. A dairy farm operated by a family with one employed worker should have from 20 to 40 cows, but with two employed workers, the optimum size of the herd might be from 50 to 60 cows. Small herds are usually found in regions where feed and pasture conditions are unfavorable for intensive dairying or on farms where other enterprises are more profitable. The cows are fed mostly on roughages, such as silage and pasture, and many are milked only through the winter when other farm work is slack. In a large number of cases the milk is separated on the farm, the cream is hauled to the creamery or nearby shipping station and sold for buttermaking, while the skim milk is held on the farm for feeding pigs and poultry.

Dairy farming may be divided into two types: production for use as market milk in fluid form, and production for use in some form of manufactured product such as cream, butter, cheese, and evaporated, condensed, or powdered milk. Near the big city markets, dairy farmers concentrate on production of milk for fluid consumption because it brings the highest returns. Farther away from the city it is more profitable to concentrate milk into butter or cheese since a hundred pounds of milk can be concentrated into 4.3 pounds of butter or 9.6 pounds of cheese. Although the great dairying area in the Great Lakes region contains such important fluid milk markets as Chicago, Minneapolis, and Detroit, it also produces about 70 per cent of all manufactured dairy products. The largest herds are found mostly in the market-milk areas or within a few hundred miles of the big cities. In these areas pastures are limited but more grain is fed and the cows yield greater quantities of milk. Whole milk is produced under rigid sanitary rules, and goes to the city for use as fluid milk or cream. Another type of dairying, especially prevalent in southern California, is the large commercial herd maintained near a large city as a milk-producing plant. Known as dry-lot dairies, they raise no young stock, and fresh cows are purchased to replace those that go dry. They are milked only as long as they maintain a good flow of milk and are then sold to the butcher. Cows are fed on purchased grain, rather than on pasture.

Farm Management. To build and maintain a herd of high-producing dairy cows, the farmer must have a good knowledge of genetics and inheritance. Most dairymen keep selected calves to replace cows that cease to produce milk economically, usually at the age of 7 to 10 years. The improvement of herds through breeding programs requires maintenance of comprehensive records to determine the ability of individual animals to transmit desirable genetic characteristics. (See Breeding.) To help keep records on individual animals and to plan breeding programs, many dairymen belong to a dairy herd improvement association, a local co-operative organization of about 25 members. The group employs a cow tester who visits each herd once a month to test the milk from each cow for butterfat content and to weigh the milk for volume. These records help guide the dairyman in feeding, breeding, and other management problems. More than 41,000 dairy farmers with about 1.3 million cows belonged to these co-operative testing groups in 1955. Cows under testing programs produced an average of 9363 pounds of butterfat in 1954, compared with a national average of 5512 pounds of milk for all cows.

A dramatic contribution of science to the dairy industry has been artificial insemination, an innovation that has greatly increased efficiency in milk production. Natural breeding requires keeping a bull on the farm, but with artificial insemination a group of farmers can eliminate the problem of buying and caring for a bull. By using this method it is possible to mate a bull to several thousand cows annually, as compared to about a hundred cows by natural service. More than 5 million cows were bred artificially in 1954, as contrasted with about 7500 cows in 1939. See Cattle, *Artificial Insemination.*

Raising calves for replacement is an important phase of dairy farming because it eliminates the risk of introducing diseases to the herd and the farmer can more accurately predict the hereditary characteristics that the cows will possess. The objective in calf raising is to produce a healthy, vigorous cow as economically as possible. In order to cut costs, many producers raise calves on milk substitutes scientifically prepared from dry skim milk, cereal grains, vitamins, minerals, and antibiotics.

Calves of larger breeds, not used for herd replacements, are sometimes sold for veal. Vealers are usually less than 3 months of age and have subsisted largely on milk. Most calves are weaned from their milk rations at about six months of age. During the period of development between one year and the age at which the female animal calves, she is referred to as a heifer. During this time the calves are fed in such a manner as to encourage rapid vigorous growth. In the

summer these requirements can be met by good pasture.

Feeding. The capacity of a cow to produce milk is limited by its genetic make-up, and the extent to which the cow reaches this capacity depends largely upon the amounts and kind of feeding. Because feed expenses represent about 50 per cent of the farmer's cost in milk production, economical feeding is one of the most important problems for the dairyman.

Pasture is the cheapest kind of feed, so dairy farmers concentrate on a vigorous program of pasture management. Research shows that cows on the very best pasture can produce up to 75 per cent of their native ability without grain feeding. Careful planning is necessary to extend the pasture season through as many months of the year as possible. Developing a suitable cropping plan involves the whole area of soil and crop management, in addition to the skills of handling the dairy animal.

In one method of pasturing used in California and other western states, known as zero pasture, the pasture is cut each day and the cuttings hauled to corrals for feeding from troughs. This method is found to increase productivity per acre tremendously. In another method more suitable for pasturing in the dairy regions, an electric fence divides the pasture and the cows are allowed to graze an additional strip every few days. This also increases the productivity of pasture land.

During the winter and barn feeding season, cattle are fed hay and various kinds of silage. Weather conditions in most parts of the country make the preparation of high-quality hay difficult. Rain falling on mowed hay, before storage, can all but ruin a hay crop. Hay may be handled in a variety of ways after cutting. After reduction of moisture content it may be raked and hauled into storage in loose form or it may be baled for easier handling. It may also be chopped by harvesting machinery into small lengths before storage. A recent innovation is the use of barn dryers. This is a fan arrangement that uses forced air to facilitate curing and to reduce spoilage. Some arrangements provide heated air which reduces the period required for drying. With a barn dryer, field drying is eliminated, thereby reducing losses that occur in harvesting and storing.

Recent advances in silage making have encouraged more dairymen to depend on various kinds of silage for winter feeding. Silage is any grass or legume, chopped into very short lengths and packed so that air does not penetrate into the mass. (See Ensilage.) Ensiling permits greater recovery of the crop than is possible by usual haymaking procedures. Since silage will keep for years, a farmer can keep a supply on hand as insurance against drought and hay shortage. Instead of depending wholly upon natural fermentation, the farmer can add preservatives to assure a superior, palatable feed. Molasses is widely used as a preservative mixed with the chopped grass or clover during the process of filling the silo. Cereal grains and citrus and beet pulp are also used to add feeding value and to promote preservation. In addition to roughage, such as hay and silage, cows must be given feed with a high protein content in order that their milk will also be rich in protein. The dairyman adds feed concentrates to the rations, usually in the form of grain or plant seeds. The most common sources of concentrate are corn, wheat, oats, barley, sorghum grains, soybeans, and cottonseed. These grains and seeds may be processed to yield a wide variety of mill feeds. On the highly specialized dairy farms, especially in the northeast and far west, the concentrates are largely purchased instead of home grown. Mixed feeds are scientifically prepared according to formulas that often contain vitamins and mineral additives. Mixed feeds have traditionally been delivered to the farms in hundred-pound bags, but some millers have found economies in making bulk deliveries in large hopper trucks which eliminate the handling of bags. This system provides for movement of loose feed by blower, gravity flow, or conveyors.

Water supply is as important as feed—a high-producing cow will drink 35 to 40 gallons of water a day. The modern dairy barn provides for watering cups at the stanchion of each cow.

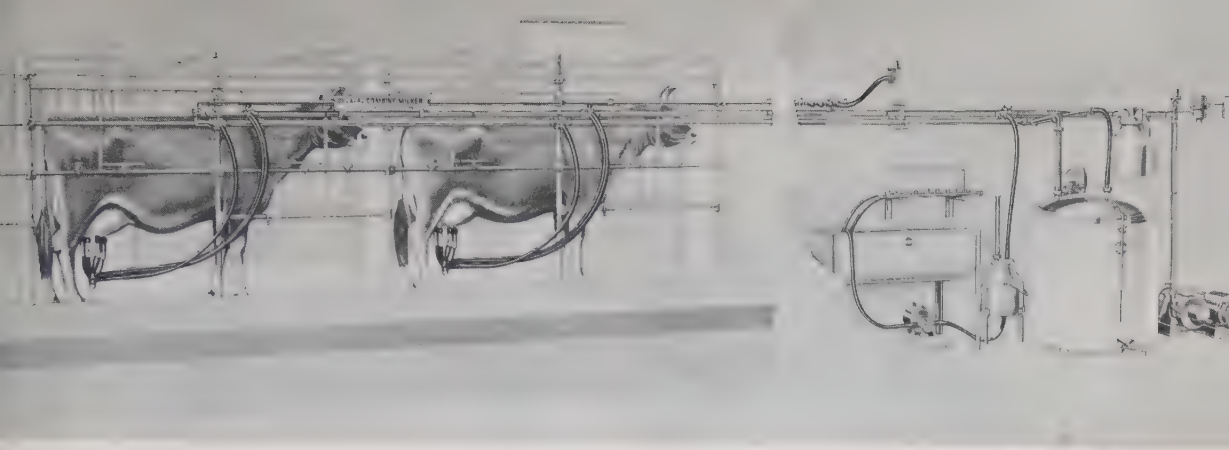
Milking. Cows on most farms are milked twice a day, but cows may be milked three times a day on farms that stress high production. Milking is the biggest chore in operating a dairy farm and is a major item in the cost of milk production. On commercial dairy farms milking is accomplished with the help of mechanical milkers, which reduce labor requirements for milk by about 50 per cent. See Milking Machine.

Insuring high quality milk begins with the procedures followed during milking. This is a crucial time in maintaining the low bacteria count necessary to meet health standards. Good milking procedures can increase output and help in the control of disease, especially mastitis, which infects the cows' mammary system and is the most serious disease problem for dairymen. See Cattle.

Good milking is so essential that in some fluid milk markets public health regulations spell out the detailed procedure to be followed. The cow's udder is usually washed with a towel in clean hot water, and a small amount of milk from each quarter is milked into a strip cup. This tends to clear the canal of any bacteria that may have found access there. The milker examines the milk from each quarter to assure that it is not clotted—clotting is an indication of mastitis or other infection. The milking machine is attached and carefully watched until the job is completed. Milk from each cow is weighed and recorded. These records enable the manager to eliminate poor cows and replace them with higher producers.

There are two kinds of barns in which milk cows are sheltered and milked: the stanchion barn and the loose housing system. In the stanchion barn each animal has a stall in which it is fastened. Loose housing allows the cows to run loose in a confined shed or other protected area, except at milking time when the cows are confined in stalls. On a growing number of farms the cows are milked in a special room called a milking parlor. The milking parlor is essential with loose housing, but also may be used with the stanchion barn. In a milking parlor two to four cows may be milked simultaneously. All milking machines and utensils are kept in one place, instead of being moved from cow to cow.

Bulk Coolers and Pipeline Milking. After milk is weighed, it is strained into the standard 8- or 10-gallon milk can. If the milk is to be used as fluid milk, these cans are placed into refrigerated coolers, usually cold-water tanks, and the temperature rapidly lowered to 50°F or lower. The cooling, required by all public milk ordinances, reduces the rate of bacteria growth. If the temperature is permitted to increase from 50°F to 55°F, the bacteria count may double within 12 hours; higher temperatures accelerate bacteria growth. To dispense with the need to carry cans of milk in and out of coolers, bulk cooling has been widely adopted. Instead of putting cans into the cooler, milk is poured directly into refrigerated bulk tanks holding from 100 to 1500 gallons. The milk is usually collected by a large tank truck, the milk being pumped from the farmer's vat into the truck tank. The bulk tank saves labor for both producer and milk processor. The processor is able to reduce his equipment costs by discarding the can washer, and to dispense with other handling operations. Pipeline milking is another innovation that has accompanied the bulk cooling method. Instead of carrying containers of milk to be poured into the cooling tank, the modern dairy farmer has installed stainless steel or glass pipelines to carry the milk from the milking machine to the cooler. The pipeline milker is especially suitable for use with a milking parlor, but also has been installed in stanchion barns.



DE LAVAL SEPARATOR CO.

The continuous milking machine eliminates steps in the handling of milk. Here, the milk flows through rubber tubes to glass pipes and thence to the cooler. The milk is then quickly transported to city dairies for processing.

Processing and Marketing

After milk is produced on the farm, the problem of getting it to the consumer in the desired form and at the right time has only begun. There are an estimated 20,000 milk distributing companies and 35,000 processing plants in the United States, with a total of 250,000 employees.

Milk is hauled from the farm to the milk plant either in bulk form or in the 8- or 10- gallon cans. Most milk plants receive milk from a local area 5 to 10 miles in radius, but manufacturing plants draw supplies from greater distances. In a market area for fluid milk the milk plant may be merely an assembly point where samples are weighed and the milk collected in large refrigerated vats for pickup by tank trucks. In the case of a processing plant the establishment may be equipped to perform many manufacturing and processing operations.

Market Milk. Milk sold to consumers in fluid form is called market milk. Almost half the milk produced in the United States is used as fluid milk and cream. The processing and distribution of these products require the services of about 1 million workers. Approximately 2 per cent of total U.S. production in 1954 was distributed by farmers from their own herds. In recent years there has been a rapid decrease in milk distribution by farmer-producers, owing to the high cost of processing equipment needed to meet health standards and the greater efficiency of large-scale operation. Production and distribution of milk are strictly supervised in almost every city. Pasteurization of milk, which spread rapidly after 1910, is so widely practiced that more than 90 per cent of all milk sold in cities is pasteurized. (See Pasteurization.) Milk is packaged in a wide variety of glass and paper containers; glass bottles were introduced in 1886 and paper containers came into use in the 1930s. About 40 per cent of all milk sold is packaged in paper containers, which are especially adaptable for selling through retail stores. Because trucks can carry many more quarts of milk in paper containers than in glass bottles, dealers have been able to extend their distribution areas enormously. See Milk.

Butter. Until the introduction of the factory system, buttermaking was entirely a farm industry, and most of the butter was still made on farms as late as 1900. The factory system was introduced into buttermaking in 1861, when Alanson Slaughter built the first creamery near Wallkill, N. Y. Cream was used to produce butter, while the skim milk was utilized for cheese making. In the early factories whole milk was received at the plant, poured into vats, and the cream skimmed off the top. The invention of the centrifugal separator by DeLaval in 1878 led to the modern practice of cream separation on the farm as the basis of the butter trade.

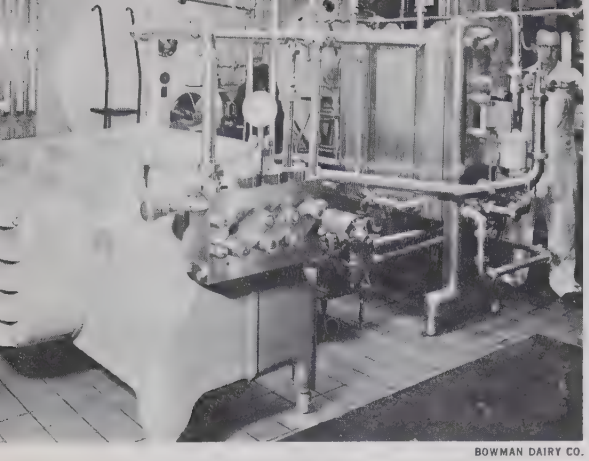
Although some butter is manufactured in connection with the fluid milk business, about two-thirds of all butter is made from farm-separated cream. More than 80 per cent of the creamery butter produced in the United States is made in the Great Lakes area. However, farm sales of cream have declined nearly one-half since the middle 1930s because of the decreasing consumption of butter. Butter production required 40 per cent of the nation's milk production in 1940, but this proportion had declined to 26 per cent in 1954. This shift away from using milk for buttermaking resulted mainly from the increasing competition of oleomargarine, which sold for about half the price of butter. See Butter.

Cheese. About 10 per cent of all milk produced is used for the manufacture of cheese. Factory production of cheese in the United States was developed somewhat earlier than that of butter and was well established by 1850. Because cheese making is not suitable for large-scale production, most cheese factories are small co-operatively owned plants. In contrast, the distribution and sale of cheese is concentrated largely in the hands of meat packers, large dairy companies, and chain stores. Trading in cheese is conducted through cheese boards located in the producing areas, the principal cheese board being located at Plymouth, Wis.

Although cheese is not as popular in the United States as in some European countries, the consumption of cheese has tended to increase in recent years because of improved quality and more convenient packaging. The introduction of processed cheese in the 1920s was an important innovation in cheese marketing because it permitted more convenient packaging for the consumer. Processed cheese is made

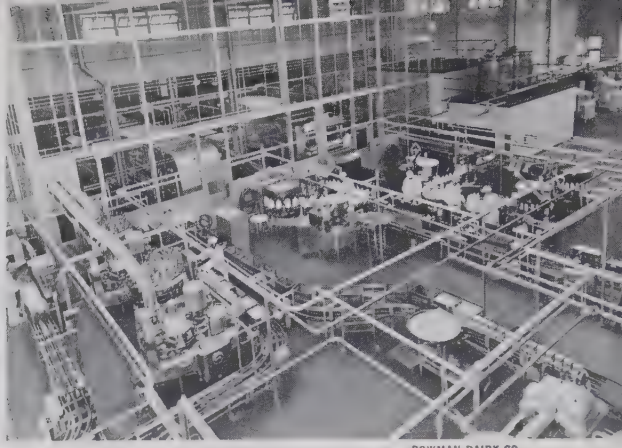
In the milking parlor, separate from their barn stalls, two cows at a time are milked by machine in about three minutes. There the milk is collected in individual jugs.

UNION PACIFIC RR.



BOWMAN DAIRY CO.

Homogenizer, left, breaks butterfat in milk into particles to flavor all the milk. Pasteurizer at right assures safe milk by bringing it to high temperature for short time.



BOWMAN DAIRY CO.

This is the interior in a pasteurizing and bottling plant of a large dairy company. Fiber carton containers are filled and sealed, foreground; glass bottles, background.

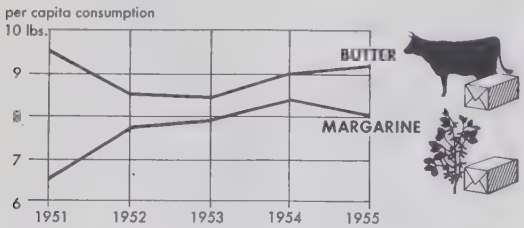
by grinding, blending, and heating natural cheeses which are then put into molds and packed in small packages. Processing not only added more variety but made use of lower grades of cheese. Methods were later devised to prepare natural cheeses in small, handy packages.

By far the most popular cheese made in the United States is of the English Cheddar variety, also known as American cheese. This type is made in various sizes and shapes which have such descriptive names as flats, longhorns, twins, and daisies. Wisconsin is the leading cheese producing state with about half of the total production. An estimated 1,353 million pounds of cheese were produced in the United States in 1955, when average per capita consumption was 7.7 pounds per person. See CHEESE.

Concentrated Milks. Milk contains about 87 per cent water, all or part of which may be removed by heating to make condensed milk, evaporated milk, or dried milk. Condensed milk is preserved by adding sugar after about two-thirds of the water has been removed. Evaporated milk is condensed milk with nothing added, sterilized in cans under pressure by live steam to kill organisms and destroy the enzymes. Dried milk is a powdered product made by removing practically all of the water. All of these concentrated forms may be made from either whole or skim milk, and are made principally in states where there are large creameries.

Nicolas Appert, a French scientist, was among the first to preserve milk by condensation in the early years of the nineteenth century. The first successful commercial method of preserving concentrated milk was patented by Gail Borden in 1856. (See BORDEN, GAIL.) About 5 per cent of total milk production in the United States is processed as evaporated or condensed milk.

Dried skim milk, known as nonfat milk solids, is the most widely used form of powdered milk, being used extensively for baking, candy, ice cream, prepared cake mixes, and animal feed. Its production was greatly stimulated by widespread use during World War II, so many farmers shifted from marketing farm-separated cream to whole milk. In 1955 about 1,385 million pounds of nonfat dry milk solids were produced, as contrasted with an annual average of 243 million pounds in the period 1937–39. Other dried milk products include dried whole milk, dried cream, dried buttermilk, dried whey, dried ice cream mix, dried malted milk, and dried sweetened condensed milk.



U.S. Per Capita Consumption of Butter and Margarine

Ice Cream. More than 8 billion pounds of milk were used to make ice cream in 1955, when average consumption of ice cream per person was 18 pounds, as compared with 11.2 pounds per person in 1940. See ICE CREAM.

The first commercial production of ice cream was started in 1851 by Jacob Fussell in Washington, D.C., to use up surplus cream. The venture was so successful that he soon opened up other ice cream plants. Consumption of ice cream increased greatly with the introduction of the ice cream cone at the St. Louis World Fair in 1904. The production of ice cream fits in especially well with the processing of fluid milk because the surplus of milk occurring in the spring months can be made into ice cream mix and frozen for final processing during the summer.

Government Regulations. Because milk is an essential food, many aspects of the milk industry are regulated in the public interest. Improperly handled milk may carry several diseases, and before the advent of modern sanitation, outbreaks of milk-borne diseases sometimes reached epidemic proportions. Modern methods, rigid inspections, and pasteurization have made epidemics rare. In 1882 Newark, N.J., passed the first municipal ordinance requiring sanitary inspection of dairy farms and plants. The U.S. Public Health Service has developed a standard milk ordinance which is in use by more than 1600 municipalities. This standard ordinance makes it possible to ship milk from one area to another. Some municipalities have enacted milk ordinances which, in addition to serving the purpose of public health, have tended to reduce competition. Sanitary regulation and laws are well established and accepted by the industry as a function of government.

State and federal milk orders are another example of government regulation in the dairy industry. These regulations have an economic basis and give recognition to the need for an adequate supply of pure and wholesome milk. Federal Milk Market Orders are price stabilizing devices that were introduced by the Agricultural Adjustment Act of 1933. These orders were in effect in more than 60 marketing areas in the United States in 1956, involving more than 30 per cent of the milk produced for milk and cream in the country. A federal order specifies that if a milk handler receives milk from a producer, he must pay at least a set minimum price. This price must be in line

with those that would exist in a free market. The prices are arrived at through formal public hearings at which producers, handlers, and consumers present testimony. Milk orders are established in a market only after a favorable vote of at least two-thirds of the farmers affected. They are discarded when more than one-half disapprove of the order. Seventeen states fixed retail prices in addition to producer prices.

At various times since 1933 the Department of Agriculture has purchased milk products in further attempts to stabilize dairy prices. During World War II direct payments were made to producers and handlers to encourage production without increasing prices. After World War II the secretary of agriculture was required by law to support the prices of milk and butterfat at between 75 and 90 per cent of the parity ratio. This was done through purchases of cheese, butter, and dried milk.

WILLIAM F. JOHNSTONE

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DAISY, any one of several plants belonging to the sunflower family, *Compositae*. Daisies are often mentioned in literature and music and are among the most popular of all wild flowers. The original daisy was probably the early flowering European plant *Bellis perennis*. In North America the wild-growing daisy is usually *Chrysanthemum leucanthemum*, sometimes known as whiteweeds, with large white flowers often an inch or more in diameter. Yellow daisies or black-eyed Susans, *Rudbeckia hirta*, have yellow flowers with brown, cone-shaped centers.

DAKAR, city, capital of French West Africa, in W Senegal, located on the Atlantic Ocean at the S tip of Cape Verde Peninsula, near the westernmost extremity of Africa; 350 miles E of the Cape Verde Islands. Dakar, the seat of the governor general of French West Africa and the leading commercial center of the region, is also a major seaport and the site of a large French naval base. The city is the hub of international air services and the terminal of a railroad leading to the interior and has excellent, modern port facilities. The chief exports are peanuts, fibers, gum, hides, and skins. The main imports passing through Dakar are textiles, oil, coal, machinery, and foodstuffs. Industries in the city include handicrafts, food processing, printing and publishing, and the manufacture of vegetable oil, clothing, tobacco, and chemicals. The city contains hospitals, a medical school and research center, mission and government schools, and a Roman Catholic cathedral.

The earliest European settlement in the vicinity of Dakar was on the small, arid island of Goree, located about one mile from the mainland. Goree was an early slaving center held successively by the Dutch, the French, and the British. In 1857 the French established Dakar as a military and trading post on the mainland. It soon eclipsed Goree in importance. The railroad from Dakar to the hinterland was begun in 1882 and the naval base was developed after 1899. Since 1902 Dakar has been the capital of French West Africa. During the period 1924–46, Dakar and the surrounding area formed a separate administrative unit, known as the Circumscription of Dakar and Dependencies. After 1946 Dakar formed part of Senegal. During World War II Dakar was at first controlled by the Vichy government of France. The Free French, aided by British naval forces, failed in an attempt to capture the port in 1940. Following the Allied successes in North Africa, however, the governor general of French West Africa opened Dakar to the Allies in 1942. After World War II the city increased considerably in population and commercial importance. (See FRENCH WEST AFRICA.) Pop. (1951 est.) 132,000.

The governor's palace in Dakar, capital of French West Africa, is one of the most impressive of the government buildings. Dakar has been called the African Gibraltar.
BLACK STAR

DAKA RIVER, W Africa, rises in the Northern Territories of the Gold Coast, flows south for its entire course of about 200 miles, and joins the Volta River about 23 miles ESE of Yeji.

DAKHLA or **EL DAKHLA,** oasis region, central Egypt, in the Frontier District of the Southern Desert, 330 miles SSW of Cairo. The oasis is located in a basin area extending some 25 miles from north to south and 50 miles from east to west. Dates, grains, fodder, fruits, and vegetables are the principal crops. El Qasr, Mut, and Balat are the major towns of the oasis. Pop. about 20,000.

DAKIN'S SOLUTION, also known as Dakin-Carrel solution, is a colorless or slightly yellowish liquid having a chlorine-like odor and antiseptic properties. Named for the English-born chemist Henry Drysdale Dakin (1880–1952), it is used in the treatment of some wounds. A solution of sodium hypochlorite, NaOCl, it is unstable and therefore should be freshly prepared before using. Since it may delay healing, Dakin's solution should be used only at the direction of a physician. See CARREL, ALEXIS.

DAKOTA. See SIOUX.

DAKOTA RIVER. See JAMES RIVER.

DAKOTA WESLEYAN UNIVERSITY. See COLLEGES AND UNIVERSITIES.

DALADIER, ÉDOUARD, 1884– , French political leader, was born in Carpentras, Vaucluse. During World War I he rose from private to captain. A leader of the Radical-Socialist party, he served in the Chamber of Deputies, 1919–40. After holding several cabinet posts, he was premier in 1933 and again, for 11 days, in 1934. As premier for the third time, 1938–40, he signed the Munich Agreement, 1938, and the declaration of war against Germany, 1939. Arrested by the Vichy government after the fall of France, 1940, Daladier was accused of having failed to provide an adequate defense against the Germans. He strongly denied the charge, but was imprisoned until May 1945. Elected to the constituent assembly, 1946, he was a member of the national assembly after 1947. See FRANCE, History.

DALAGUETE, town in the Philippine Islands, on the SE coast of Cebu Island, in Cebu Province; 45 miles SSW of the city of Cebu. Dalaguete is a market center for the surrounding area producing corn, coconuts, poultry, and tobacco. Coal deposits are found nearby. Pop. 29,333.

DALAI LAMA. See LAMAISM.

DALÄLVEN. See DAL RIVER.

DALE, SIR HENRY HALLETT, 1875– , English physiologist, was born in London. Known for his work in pharmacology, he shared with Otto Loewi the 1936 Nobel prize in physiology and medicine for his work on the chemical transmitters for various nerve impulses. Dale was chairman of the Wellcome Trust after 1936, and president of the

Royal Society of Medicine, 1948–50. See Autonomic Nervous System.

DALE, RICHARD, 1756–1826, U.S. naval officer, was born in Norfolk County, Va. Dale fought with John Paul Jones on the *Bonhomme Richard* against the *Serapis*, 1779, and commanded a squadron which blockaded Tripoli for six months, 1801–02.

DALE, SIR THOMAS, died 1619, English colonial administrator, went to Virginia as high marshal, 1611. Finding the colonists lazy, insubordinate, diseased, and ill-fed, he established a severe code of laws, popularly known as Dale's Code. Appointed acting governor, 1614, Dale checked the spread of malaria and made the colony prosperous. He made peace with the Indians by approving the marriage of Pocahontas and John Rolfe, both of whom accompanied him to England in 1616.

DALGARNO, GEORGE, 1626?–87, Scottish educator, was born in Aberdeen. The author of *Ars signorum* (1661), a treatise in which ideas were represented by letters of the alphabet, he described the first two-hand deaf-and-dumb alphabet in *Didascalocophus* (1680).

DALHART, city, NW Texas, in the panhandle, in Dallman and Hartley counties, county seat of Dallman County, on the Rock Island and the Fort Worth and Denver railroads and U.S. highways 54 and 87; 69 miles NNW of Amarillo. Dalhart is a railroad division point and a market center for the surrounding farm and ranching areas. The city has grain elevators, feed mills, machine shops, and a packing plant. First settlement here was made about 1885 by the XIT ranch, said to be the largest fenced ranch in Texas at that time. Pop. (1950) 5918.

DALHOUSIE, town, E Canada, N New Brunswick, county seat of Restigouche County, at the mouth of the Restigouche River, at the head of Chaleur Bay, on the Canadian National Railway; 145 miles N of Fredericton. Dalhousie has fishing and lumbering industries, and it ships newsprint. A fine beach attracts tourists. Pop. (1951) 4939.

DALI, SALVADOR, 1904– , Spanish painter, was born at Figueras in Catalonia. After a boyhood spent on the Mediterranean Coast, he conscientiously studied the academic routine at a fine arts academy in Madrid under a teacher who had also taught Picasso. He soon began to read Freud and philosophy; from art journals he learned of cubism and futurism. After a short period in which he attempted to reconcile cubism with the techniques of the old masters, he developed his own world of imagery: distant perspectives of marine landscapes, clear and luminous, with a foreground containing such unrelated elements as suggestions of anatomical debris, mechanical devices, and so on. Beginning in 1924 his life began to take on a public character: he made contact with the surrealist movement, painted his famous *Blood Is Sweeter than Honey*, published his Manifesto Groc at Barcelona in 1928, invited the Paris surrealists to come to Cadaques (in Catalonia), and defined his art rather aptly as "paranoiac-critical activity." He married Gala Eluard who thenceforth figured in most of his imagery and painting. In his search for the ultimate in naturalism he turned to photography and assisted in making the two surrealist films *Le chien Andalou* and *L'Age d'or*. He made aesthetic use of visionary experiences, reinterpretations of memory, and psychologic and even pathologic deformations which, within a new framework, took on new meanings. In the late 1930s Dali began to depend on more conventional influences and was denounced by his former comrades for his "ultra-retrograde, academic technique." After 1940 he established himself in the United States, where he became financially successful. He still maintained a home in Spain, however, where some notorious religious paintings such as *The Madonna of Port Lligat*, were executed. In the 1950s he began to design jewelry in a *fantaisiste* manner, with immense public success. He also wrote several successful books, among them *The Secret Life of Salvador Dali* (1942) and *50 Secrets of Magic Craftsmanship* (1948). Probably his best known painting is *The Persistence of Memory* (1931). See Surrealism. Anthony Kerrigan

DALIN, OLOF VON, 1708–63, Swedish historian, poet, and journalist, was born in Vinberg. A man of wide interest and versatile talents, he was literary dictator to Sweden in his day, and established a cultural trend based on his own tastes, for French and English classicism. His weekly paper *Den Svenska Argus* (1733–34), modeled on Addison's *Spectator*, was largely responsible for fixing the modern form of the Swedish language. In 1755 the Riksdag commissioned him to compile a history of Sweden, *Svea Rikes Historia* (1747–62). He was appointed tutor to Crown Prince Gustavus, afterward Gustavus III, in 1751, but his complicity in the revolutionary projects of Queen Louisa Ulrica lost him this post and he was banished from the court until 1761. He was also the author of the epic *Svenska Friheten* (1742).

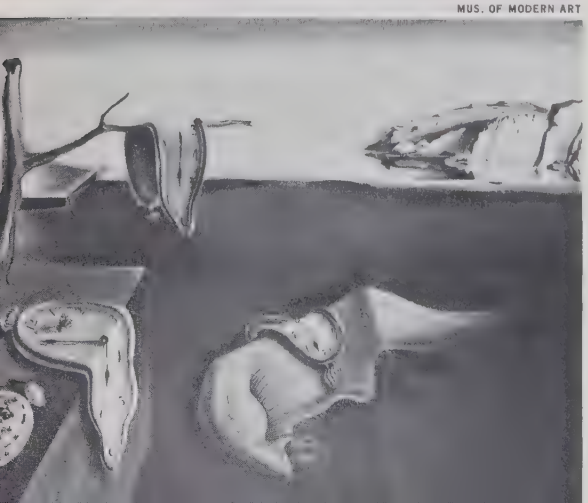
DALKEY, town, E Ireland, in SE County Dublin, on the Irish Sea, 9 miles SE of Dublin. Dalkey is a vacation resort and residential center. It contains a restored fifteenth century castle and some ancient ecclesiastical remains. During the medieval period Dalkey was a major Irish seaport. Pop. about 4500.

DAL LAKE. See Srinagar.

DALLAS, ALEXANDER JAMES, 1759–1817, U.S. financier and executive, was born in Jamaica, W.I., and educated at the University of Edinburgh. In 1783 he migrated to Philadelphia, where he practiced law and in 1801 became U.S. district attorney. He helped form the Constitutional Republican party,

One of Dali's best-known surrealist paintings was *The Persistence of Memory*, an oil completed in 1931, in which limp watches dangle weirdly in a lugubrious landscape.

MUS. OF MODERN ART



Typical of Salvador Dali's dreamworld creations in pen and ink was his *Studies of Horsemen*, executed in 1936. Spanish-born, he lived in the United States after 1940.

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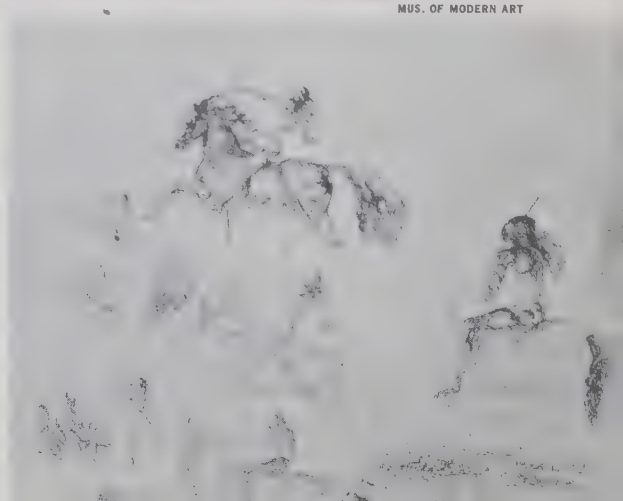


1805, which became the conservative element in state politics. President Madison appointed him secretary of the treasury in 1814, at a time when the treasury was bankrupt; through stringent measures, Dallas built up a surplus of $20 million. He was instrumental in establishing the second U.S. Bank, 1816, and in helping secure the passage of the Protective Tariff Act of 1816. Dallas wrote *An Exposition of the Causes and Character of the War of 1812* (1815).

DALLAS, GEORGE MIFFLIN, 1792–1864, son of Alexander James Dallas and U.S. political leader, was born in Philadelphia. He was U.S. senator, 1831–33, minister to Russia, 1837–39, vice-president of the United States, 1845–49, and minister to Great Britain, 1856–61.

DALLAS, town, NW Oregon, county seat of Polk County, in the Willamette Valley, on the Southern Pacific Railroad, 14 miles W of Salem. Dallas has lumbering and fruit processing industries. Pop. (1950) 4793.

DALLAS, city, NE Texas, county seat of Dallas County, on the Trinity River; the Frisco, the Fort Worth and Denver, the Kansas City Southern, the Missouri-Kansas-Texas, the Santa Fe, the Saint Louis Southwestern, the Southern Pacific, and the Texas and Pacific railroads; and U.S. highways 67, 75, 77, 80, and 175; a scheduled airline stop; 32 miles E of Fort Worth. Dallas is the second largest city in Texas; pop. (1950) 434,462; metropolitan area 614,799.

Features of Interest. Situated in the fertile black belt of Texas and surrounded by oil fields, Dallas is one of the leading industrial and commercial centers in the Southwest. It is an inland cotton market, an oil supply center, a transportation hub, a banking and insurance center, a printing and publishing center, and a regional distributing point for automobiles and wholesale goods. Noted for its retail stores, Dallas ranks as a leading clothing style center. Some of its chief manufactures are aircraft, airplane parts, textiles, clothing, chemicals, oil well and cotton gin machinery, and heating, refrigerating, and air conditioning equipment. There are woodworking, leather, food products, meat packing, and portland cement and gravel industries. Dallas is the headquarters for the Eleventh Federal Reserve District and the home of the Federal Reserve Bank of Dallas. It is the seat of Southern Methodist University, Dallas Theological Seminary and Graduate School of Theology, the schools of dentistry and nursing of Baylor University, and the Southwestern Medical School of the University of Texas. A U.S. Naval Air Station is located at Dallas.

The Texas state fair, one of the nation's largest, attracts many visitors each year. In the State Fair Park are the Hall of State, housing exhibits of the Dallas Historical Museum; the famed Cotton Bowl Stadium, with a seating capacity of more than 75,000 persons; the Aquarium; the Museum of Natural History; the Museum of Fine Arts; the Health Museum; and numerous exhibition halls and buildings. The city is the home of the Dallas Symphony Orchestra and a little theater. Dallas has a zoo and several thousands of acres of parks. White Rock Lake Park, located near the northeast edge of the city, is a favorite recreation area.

History. The first permanent settlement in Dallas was made by John Neely Bryan in 1841. Dallas was named for George Mifflin Dallas, vice-president of the United States during the administration of James Polk. A socialist colony established by about 350 French intellectuals in 1855 on what is now the southwest edge of the city ended in failure. After the Civil War the city's population grew rapidly with a large influx of ruined cotton planters from the southeastern states. A beneficial by-product of a disastrous flood in 1908 was the introduction of a city plan by George E. Kessler. Its implementation resulted in straightening of the Trinity River channel, flood control and land reclamation measures, wholesale boulevard, street, and viaduct construction, and progressive zoning laws. Dallas had adopted the commission form of government in 1907 but abandoned it in 1930 for the council city-manager plan. The Texas Centennial Exposition was held in State Fair Park in 1936. In 1956 the city celebrated its centennial of incorporation.

REPUBLIC NATIONAL BANK OF DALLAS

Dominating the Dallas skyline is the ultramodern, metal-sheathed Republic National Bank. Although surrounded by oil fields, Dallas is the nation's greatest cotton market.

DALLES CITY, or The Dalles, N Oregon, county seat of Waco County, on the S bank of the Columbia River, on the Union Pacific Railroad and U.S. Highway 30; 74 miles E of Portland. Dalles City is a trade center for grain, fruit, livestock, fish, and dairy products. Industries include salmon fishing and canning, lumbering, and fruit canning. It is at the head of navigation for ocean vessels on the Columbia River and has port and terminal facilities. The Dalles-Celilo Canal carries traffic around the rapids above the city. A Methodist mission was established here in 1837; later a fort was built, around which the city grew. Pop. (1954 special census) 9864.

DALLIN, CYRUS EDWIN, 1861–1944, U.S. sculptor, was born in Springville, Utah, and studied in Paris under Henri Chapu. His first equestrian statue, *Signal of Peace* (1890), was awarded the gold medal at the Columbian Exposition in Chicago. Dallin specialized in sculptured studies of the American Indian.

DALMARNOCK, suburb of the city of Glasgow, Scotland, in Lanarkshire, on the Clyde River. Dalmarnock forms part of the southeastern section of Glasgow. It is a residential and industrial district. Pop. about 35,000.

DALMATIA or **DALMACIJA,** region, W central Yugoslavia, in Croatia, bounded by Bosnia and Herzegovina on the NE and E, and the Adriatic Sea on the S and W; area 4915 sq. miles; pop. about 665,000. Dalmatia is about 200 miles long and 50 miles wide at its greatest breadth. It is unequally divided into two sections, extending from the Velebit Channel to the Gulf of Kotor and interrupted by a small area of Bosnia and Herzegovina.

Topography. The coast is a generally narrow, low lying plain. Off the coast are a number of islands, the most important being Pag, Dugi Otok, Brač, Hvar,

EUROPEAN

A Dalmatian angler tries his luck along the rugged shores of the Adriatic in southern Yugoslavia. The scenic coast of Dalmatia has long been a famed European resort area.

Korcula, Mljet, Vis, and Solta. The rugged Dinaric Alps rise steeply to heights of about 6000 feet above the coast and the Karst plateau. The climate is subtropical; the coastal plain has rather mild winters, being protected by the mountainous area from the bora—a strong northeasterly wind, unusually cold and usually accompanied by rain, sleet, or snow—which sweeps over the mountains in winter. Several rivers drain from the region; the most important are the Neretva, the Cetina, and the Krka.

Social and Economic Factors. The inhabitants are mostly Croats and Serbs. Serbo-Croatian is the official language, although Italian is used in some urban areas. Elementary education is found throughout Dalmatia, and there are numerous secondary schools, as well as commercial and professional ones. The chief towns are Split, the capital, and Dubrovnik, Šibenik, and Zadar (Zara). In Split is the Palace of Diocletian, a Roman monument, dating from about 300 (see DIOCLETIAN). At the site of the ancient city of Solin, about 3 miles northeast of Split, are ruins of a Roman amphitheater, city walls, gates, and fragments of arches, houses, baths, and basilicas. Noteworthy examples of Romanesque structures are the belfry of Santa Maria at Zadar and the twelfth century campanile on Rub Island.

Only a small proportion of the total land area is under cultivation, the chief crops being oats, barley, corn, rye, wheat, potatoes, olives, figs, and grapes. Mineral products include bauxite, principally found in the north; coal and lignite, in the vicinity of Šibenik; cement, centered around Split; and salt, recovered from the Adriatic Sea. Other industries include shipbuilding, fishing, and the production of wine and olive oil. The Dalmatian coast is a noted summer resort because of its mild climate, fine bathing beaches, and scenic beauty.

Location Map of Dalmatia

History. Dalmatia formed a part of the Illyrian kingdom (see ILLYRIA), which was partly conquered in 168 B.C. by the Romans and completely conquered in the time of Augustus. In the fifth century it was invaded by the Avars. In the sixth century it was annexed to the Byzantine empire and in the seventh century, settled by the Slavs. Dalmatia was divided between the kingdoms of Croatia and Serbia in the tenth century, while Venice held several islands and ports. From the eleventh to the fifteenth centuries different parts of Dalmatia were under the authority of Hungary, Croatia, and Venice. The Turks occupied a part of Dalmatia in the sixteenth century. In 1797 the Venetian portion of Dalmatia was ceded to Austria. In 1805 Dalmatia was united with Napoleon's Italian kingdom; and in 1815, to Austria-Hungary, of which it became a crown land. By the Treaty of London, 1915, most of Dalmatia was assigned to Italy. The claims of the newly created Yugoslav kingdom, however, based upon the large Slav population in Dalmatia, conflicted with the Italian plan and the status of the territory was settled by the Treaty of Rapallo, 1920. This treaty granted all of Dalmatia to Yugoslavia with the exception of Zadar and a few small islands assigned to Italy. After Yugoslavia's military collapse during World War II, Dalmatia was annexed to Italy. It was invaded by Allied forces, aided by native guerrillas, and liberated in early 1946. After the war the territories ceded to Italy by the Treaty of Rapallo were returned to Yugoslavia. In 1946 Dalmatia was included in Croatia, within which in 1949 it was constituted an administrative region. See CROATIA; YUGOSLAVIA; SERBIA; DUBROVNIK; ZARA.

COLONIAL COACH KENNELS

Dalmatian, or Spotted Coach Dog

DALMATIAN, or spotted coach dog, a hardy, popular show dog and pet, closely resembling the pointer in size and shape. An ancient breed of uncertain origin, the Dalmatian of the coach and carriage period was almost exclusively used as a coach dog. It has been widely adopted by fire department squads as a mascot. The breed weighs between 35 and 50 pounds and grows to a height of 19 to 23 inches. The dog's sleek white coat is marked with well-defined black or brown spots; the pups are pure white at birth. The head is fairly long, the skull flat, and the eyes, medium in size, are black to light brown. The moderate-sized ears grow rather close to the head. Dalmatians have straight and heavily boned legs; the chest is deep and of moderate width. The back is slightly arched and the tapered tail is carried with a slight upward curve. See DOG, color plates.

DALNY. See DAIREN.

DALRIADA, "home of the descendants of Riada," an ancient Gaelic kingdom of Northern Ireland, occupying the northern part of County Antrim, and its

colony which crossed the North Channel to Scotland about 500 and settled in Argyllshire. The Scottish kingdom of Dalriada continued under the domination of the Irish kingdom until about 575, when it became independent under Aidan. King Kenneth MacAlpin, a successor of Aidan, united the Scots and Picts in the kingdom of Alban in 844. The Irish Dalriada disappeared in the twelfth century.

DAL RIVER, Swedish Dalalven, river in central Sweden, rises in the mountains near the Norwegian-Swedish border as two streams, the East Dal (Österdalälven) and the West Dal (Västerdalälven), both flowing SE to form the Dal River about 15 miles WSW of Falun and entering an estuary of the Gulf of Bothnia about 10 miles SE of Gävle. Its total length is about 280 miles. It is an important source of power for Sweden's lumber and steel industries.

DALTON, JOHN, 1766–1844, English scientist who formulated the atomic theory. He was born in Eaglesfield, Cumberland, and aside from six years of formal schooling was self-taught. His success as a lecturer in natural philosophy led to his being made professor of mathematics and physics in 1793 at New College, Manchester, where he continued the meteorological investigations which he had begun at Kendal, and studied the phenomenon of color blindness, sometimes called Daltonism, from which he suffered. In 1801 Dalton published several important papers on the properties of gases, including *On the Constitution of Mixed Gases*, *On the Force of Steam*, and *On the Expansion of Gases by Heat.*

Dalton's investigations of atmospheric gases led him in 1803 to believe that these gases (as well as liquids and solids) were composed of "ultimate particles," or atoms. He thus revived a theory as to the composition of matter which had been proposed by the Greek philosopher Democritus as early as the fifth century B.C. Out of his study of the combinations of oxygen with nitrogen to form nitrous oxide, nitric oxide, and nitrogen tetroxide, he came to believe that chemical changes were the result of the union of one or more atoms of one element with one or more atoms of other elements. (See Atomic Energy, History; Atomic Theory.) Dalton also inquired into the relative atomic weights of some 21 elements and sought to determine the formulas for a number of chemical compounds. See Democritus; Color Blindness.

DALTON, city, NW Georgia, county seat of Whitfield County, on the Nashville, Chattanooga, and St. Louis and the Southern railroads, and U.S. highways 41 and 76; 27 miles SE of Chattanooga, Tenn. Dalton is a trading and industrial center. Its principal manufactures are tufted textiles, especially bedspreads and carpets. Other industries include printing and publishing and the manufacture of yarn, thread, tents, and furniture. During the Civil War, the Confederate Gen. Braxton Bragg retired to Dalton after his defeat in the Chattanooga Campaign, Nov. 23–25, 1863, and here his successor, Gen. Joseph E. Johnston, organized his defense against Gen. William T. Sherman's invasion. In early May 1864 Union troops suffered serious losses in attacks on Dalton. Johnston withdrew to meet Sherman in a battle at Resaca, 18 miles south. On May 13, 1864, Dalton was occupied by Union troops. On Oct. 13, 1864, it was taken by Confederates under John B. Hood, but was not permanently held. (See Chattanooga Campaign; Sherman, William Tecumseh.) Pop. (1950) 15,968.

DALTON, town, W central Massachusetts, in Berkshire County, in the Berkshires, on the upper Housatonic River and the New York Central Railroad; 4 miles ENE of Pittsfield. Dalton is a resort; its principal manufactures are paper and textiles. Pop. (1950) 4285.

DALTON PLAN. See Education, Educational Theories and Methods.

DALTON'S LAW OF PARTIAL PRESSURE. See Partial Pressure, Law of.

DALY, AUGUSTIN, full name John Augustin Daly, 1838–99, U. S. dramatist and producer, was born in Plymouth, N.C. Daly produced his first successful play in 1862 and during the next few years experimented in the adaptation of German and French plays and dramatizations of novels. He then formed his own company and presented some of the best of the older English comedies. His original plays, *Horizon* and *Divorce*, presented in 1871, marked him as a realist. In 1873 he formed the first organization of New York producing managers. He later presented a series of Shakespearean comedies with Ada Rehan in the leading roles and took his company to London, where he opened his own theater in 1893. In all, Daly wrote or adapted about 90 plays.

DALY, MARCUS, 1841–1900, U.S. mine owner, was born in Ireland and emigrated to the United States at the age of 15. Starting as a pick-and-shovel man, Daly helped organize the Anaconda Copper Mining Company and later developed the Amalgamated Copper Company, with a capitalization of $75 million. He was involved in western politics and contributed heavily to William Jennings Bryan's 1896 presidential campaign. See Clark, William A.

DALY CITY, city, W central California, in San Mateo County, on the Southern Pacific Railroad and U.S. Highway 101; a S residential suburb of San Francisco. In Daly City are fruit orchards, flower growing concerns, and dairy plants. Pop. (1956 special census) 30,506.

DAM, HENRIK, 1895– , Danish biochemist, was born in Copenhagen. In 1940 he came to the United States as a war refugee and remained to do research at the University of Rochester and at the Rockefeller Institute for Medical Research in New York City. While in the United States he was named joint winner, with Edward A. Doisy, of the 1943 Nobel prize in physiology and medicine in recognition of his discovery of vitamin K. See Vitamin.

DAM

Man harnesses rivers to control floods and provide water supplies for his many needs.

DAM, an artificial barrier usually placed across a natural watercourse, but sometimes in an off-stream location, with water conveyed to the reservoir thus formed by pipelines or canals. Dams range in size from those built of sticks and mud by beavers to huge earth-fill and concrete dams hundreds of feet high.

Design and Construction

Classification. Dams are classified according to their basic function, their specific purpose, their manner of discharging excess water, the material of which they are constructed, and type of construction with a given material.

Basic functions include storing water, diverting water from a stream into a canal or pipeline, confining a stream to an established channel, raising the level of a stream, and excluding water from a given area.

The primary *specific purposes* for which dams are constructed are domestic and industrial water supply, irrigation, power production, river regulation, flood control, navigation, creation of recreation areas, and stream-pollution control. Multipurpose dams serve several of these purposes.

Some dams are so designed that excess water is discharged over their crests (Fig. 8). Others discharge through a spillway section that is part of the main structure, through a separate spillway that may be adjacent to the dam or at some other location, or through a hollow vertical shaft in the reservoir connected with a tunnel whose outlet is below the dam. If a considerable portion of the dam serves as a spillway it is called an overflow dam, spillway dam, or weir.

Materials used in major dams are masonry (almost always concrete in the United States and Canada),

INTERNATL. BOUNDARY AND WATER COMM.

Falcon Dam, on the Rio Grande, went into operation in 1953. Longest in the world when built, the $47 million project provides power, irrigation, and flood control.

earth fills, and fills of broken rock. Small dams are often constructed of timber or steel-plate decks to retain the water and transverse steel frames to support the decks.

Principal types of masonry dams are the massive stone or concrete solid-gravity dam (Fig. 1), which resists water pressure and transmits it to the foundation primarily by its weight; the stone or concrete single-arch dam (Fig. 2), which resists water pressure primarily by arch action and transmits it to the canyon walls; the arched-gravity dam (Fig. 3), which combines gravity and arch action; the slab-and-buttress dam (Fig. 4), which retains the water with a reinforced-concrete slab deck supported by triangular buttresses; and the multiple-arch dam (Fig. 5), with a deck consisting of a series of reinforced-concrete arches supported by triangular buttresses.

Principal types of earth dams are the rolled fill (Fig. 6) and the hydraulic fill. The rolled fill consists of upstream and downstream zones of compacted coarse material (such as sand, gravel, and other earth material that is stable and permeable) and an interior zone of compacted, relatively impermeable earth material (such as clay) that serves as a water barrier but would not be stable without the support of the outer zones. Protective surfaces (such as rock paving or dumped rock riprap) are placed on the top and on the upstream face to prevent erosion. Hydraulic-fill dams are constructed of earth carried by water through flumes or pipelines and released at the desired location in such a manner that the coarse material forms in upstream and downstream zones, similar to those in Fig. 6, and the fine material forms a puddle in the inner zone that eventually makes a rather solid and impervious core as excess water drains away. They are given the same types of slope protection as are rolled-fill dams.

Rock-fill dams (Fig. 7) consist mainly of an embankment of large rocks dumped in place, which provides stability to resist the water pressure. A reinforced-concrete slab, a sheet of steel plates, or a timber membrane on the upstream face makes the structure watertight.

Foundations. Concrete and stone masonry dams, except for those that are quite low, are always founded on rock, earth dams usually on earth or hardpan, and rock-fill dams on rock or hardpan. Rock formations are not solid but are broken up by seams, cracks, bedding planes, faults, solution channels, and even caverns. These defects are treated by forcing cement grout (a mixture of cement, sand, and water) through drilled holes into the open spaces to make the foundations stable and sufficiently watertight.

Earth foundations must be strong enough to carry the weight of the dam and impermeable enough to prevent excessive loss of water and undermining by seepage under the dam. This seepage usually carries away the fine earth particles first, causing the river's rate of flow and its carrying capacity to increase until progressive failure of the dam occurs. Flow of water under dams is restricted by cutoffs of various types between relatively impermeable underlying formations and the inner zone of the dam (Fig. 6). It can also be reduced by providing an upstream blanket of clay to increase the distance through which the seepage water must flow, thereby reducing its velocity enough to prevent undermining or excessive loss of water.

Special safeguards are required where the decks of slab-and-buttress, multiple-arch, and rock-fill dams join the rock foundations. These usually consist of grouted curtains made by drilling holes into the rock and forcing cement grout in to fill any open spaces that the holes intersect. Grouted curtains are usually provided near the upstream face (Figs. 1, 3, 4, 5, 7). Drain holes are often provided immediately downstream from the grouted curtain to intercept water that passes the curtain and carry it to the downstream face, thereby decreasing water pressure under the dam (Figs. 1, 3).

Uses of Dams

Irrigation. The simplest means of irrigation is to divert water from a stream to nearby land that lies lower than the point of diversion. This usually requires construction of a stream barrier called a diversion dam. Small diversion dams are built of materials readily available, such as rocks, brush, and logs made watertight by plugging openings with earth, sod, or other material. Others are major structures of concrete.

Diversion dams often are not adequate, however, because of the varying flow of streams resulting from fluctuations in rainfall and runoff. It is then necessary to build dams that create storage reservoirs (see Irrigation; Reservoir). By the mid-1950s there were about 50,000 diversion dams in the United States, and about 7000 constructed wholly or in part to provide storage for irrigation. The U.S. Bureau of Reclamation constructed many of the storage dams. Some of the outstanding ones are the 417-foot concrete arched-gravity Owyhee Dam in Oregon, the 350-foot concrete arched-gravity Arrowrock Dam in Idaho, the 265-foot earth-fill Alcova Dam in Wyoming, the 240-foot earth and rock-fill Dixon Dam in Colorado, and the 235-foot hydraulic-fill Tieton Dam in Washington (see Reclamation; Reclamation, U.S. Bureau of). The 256-foot concrete multiple-arch Lake Pleasant Dam in Arizona was constructed by a nonfederal irrigation district. Outstanding irrigation dams in other countries include the stone masonry Aswan Dam across the Nile in Egypt. See Aswan.

Water Supply. Many important dams have been built to provide water for domestic and industrial use in cities. New York City has several in the Catskill and Delaware basins from which water is carried 100 miles or more to the city through aqueducts (see Aqueduct). Among these are the Kensico, New Croton, Ashokan, Neversink, and Merriman dams, all more than 200 feet high. Boston is supplied by Wachusett and Winsor dams, the latter creating a reservoir with a capacity of 1.27 million acre-feet, making it the largest municipal water-supply reservoir of its time. (An acre-foot is the volume of water in a space one foot deep and one acre in area.)

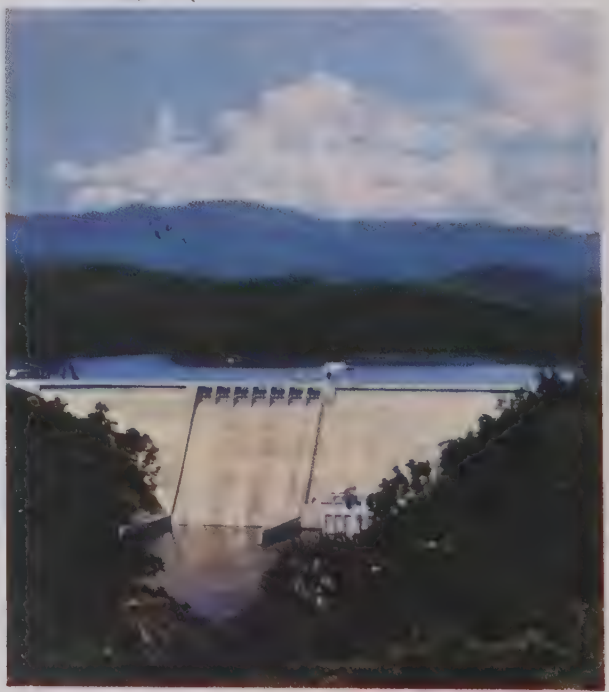
San Francisco's water supply is provided principally by the Hetch-Hetchy reservoir created by the 430-foot concrete arched-gravity O'Shaughnessy Dam in Yosemite National Park 170 miles east of the city in the high Sierra Nevada. The Metropolitan Water District of Southern California, which includes Los Angeles and adjacent cities, and the San Diego metropolitan area are supplied by the Colorado River from a point about 250 miles east of Los Angeles. Water is taken from the river at Parker Dam, about 150 miles below Hoover Dam (see Aqueduct, *The*

Shasta Dam, located on the Sacramento River in California's Central Valley, is one of the world's highest and largest concrete dams. Construction of the dam required about seven years and was completed in 1945. This concrete "giant" now provides flood control, irrigation, and power to the "Golden State"

Fort Peck Dam on the Missouri River in Montana, built to benefit downstream navigation, is the world's largest earth-filled dam. When the present river development program is completed, water from the Fort Peck Reservoir will eventually irrigate about one million acres

Hoover Dam, the concrete dam spanning the gorge of the Colorado River, serves Nevada, Arizona, and California. This, the world's highest dam, rises 726 feet above bedrock in the sheer walls of Black Canyon. Its reservoir, Lake Mead, the world's largest artificial lake, is 115 miles long

Grand Coulee Dam, on the Columbia River in Washington, is one of the world's largest masonry structures, 4,173 feet long at the crest and 550 feet high



Hiwassee Dam is a tributary project of the Tennessee Valley Authority. This concrete dam was designed primarily for control and storage of flood waters

UNION PACIFIC R.R.; BUREAU OF RECLAMATION; TVA

Bonneville Dam, on the Columbia River near Portland, Ore., was constructed by U.S. Army Engineers for power development and improvement of navigation. This concrete, straight gravity structure now provides slack water 50 miles inland to accommodate the passage of ocean-going vessels

Norris Dam, the first dam built by the Tennessee Valley Authority, is 20 miles NW of Knoxville on the Clinch River. This dam, of the gravity type, is 265 feet high and 1,860 feet long. Water power from the dam is employed to generate electricity. The dam is also a protection for flood control

UNION PACIFIC R.R.; TVA

Watts Bar Dam, built on the Tennessee River, is a main river project of the Tennessee Valley Authority. It is one of several dams which provide a nine-foot water channel from Paducah, Ky. to Knoxville. At Watts Bar, locks are employed to lift and lower the boats 70 feet

Fontana Dam, a tributary project of the Tennessee Valley Authority, is located on the Little Tennessee River in North Carolina. Fontana, in conjunction with the Kentucky dam and others, will reduce the Mississippi flood crests as much as three feet, the difference between security and disaster

TYPES OF DAMS

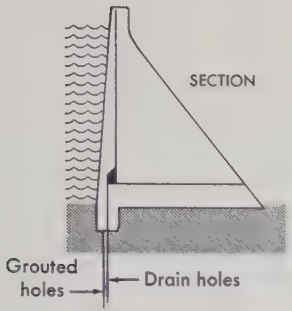


Fig. 1. GRAVITY

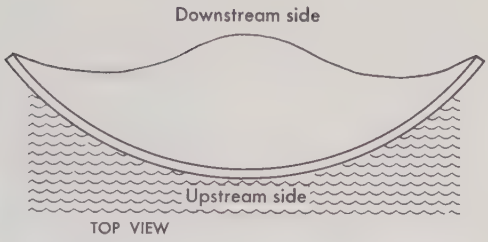
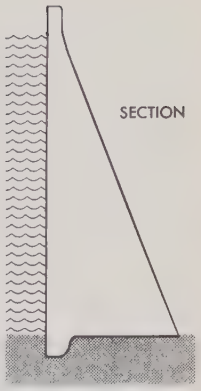


Fig. 2. SINGLE ARCH



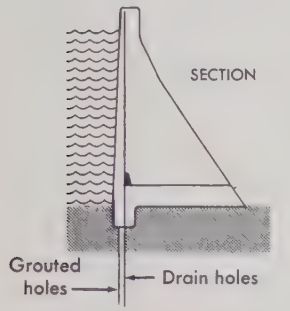


Fig. 3. ARCHED GRAVITY

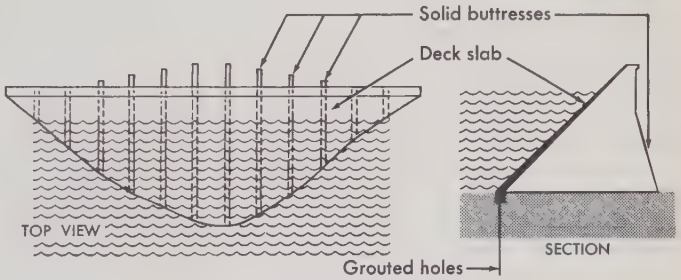


Fig. 4. SLAB AND BUTTRESS

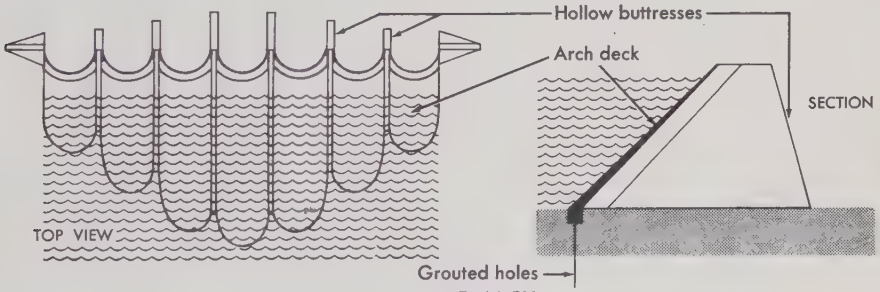


Fig. 5. MULTIPLE ARCH

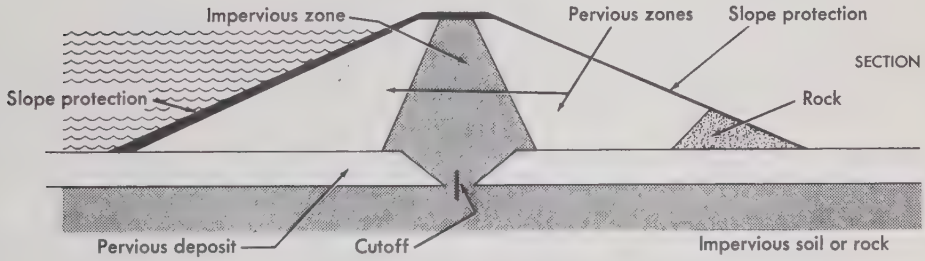


Fig. 6. ROLLED EARTH FILL

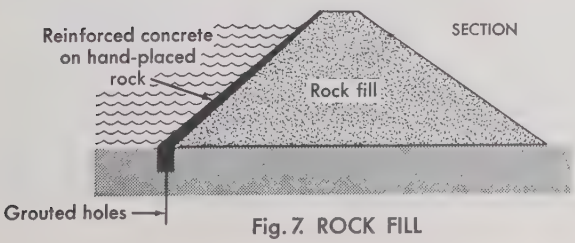


Fig. 7. ROCK FILL

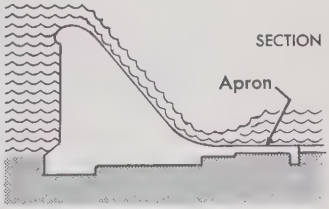


Fig. 8. GRAVITY OVERFLOW

Colorado River Aqueduct; COLORADO RIVER; HOOVER DAM).

Navigation. River improvement for transportation often requires construction of dams, which raise the water level and thereby increase the depth, and of locks, which enable boats to pass the dams. On some rivers it is necessary to construct dams at intervals so that the pool created by one dam extends upstream to the next dam with a specified minimum depth. Because the current moves slowly in these pools they are called slackwater pools. In some cases locks and dams are needed only to pass rapids, in other cases obstructions are by-passed by canals and locks. See CANAL; WATERWAYS, INLAND.

When the Tennessee River was developed under the Tennessee Valley Authority, created by Congress in 1933, it became the most highly developed river in the world. A system of locks and dams converted it into a continuous series of slackwater pools extending 630 miles from Knoxville to its junction with the Ohio River, and its flow was regulated by several storage dams on its tributaries. See TENNESSEE VALLEY AUTHORITY.

A series of 26 navigation locks and dams was constructed on the Mississippi River between St. Louis and Minneapolis, and below St. Louis the river was improved by construction of 3500 miles of levees. These works provided a minimum navigation depth of 9 feet between Minneapolis and the Gulf of Mexico. Levees are continuous earth dams that confine a stream to an established channel. See MISSISSIPPI RIVER.

Forty-six locks and dams on the Ohio River provide a navigation channel with a minimum depth of 9 feet from its junction with the Mississippi River at Cairo, Ill., to Pittsburgh, Pa., and above Pittsburgh in the Allegheny and Monongahela Rivers. See OHIO RIVER.

The Missouri River was made navigable for 760 miles from its junction with the Mississippi River near St. Louis to Sioux City, Iowa. This was achieved by construction of levees and by regulation of the flow of the river with Ft. Peck Dam in Montana, Garrison Dam in North Dakota, and Oahe and Ft. Randall dams in South Dakota. Planned combined storage capacity of the dams was about 64 million acre-feet. See MISSOURI RIVER.

Bonneville Dam and other improvements have made the Columbia River navigable for ocean-going vessels for 138 miles from the Pacific Ocean to The Dalles (see BONNEVILLE DAM; COLUMBIA RIVER). Above that point the Columbia and its tributary the Snake River are navigable for shallow craft for an additional 274 miles to Lewistown, Idaho. McNary Dam helped make this possible.

Power. One of the earliest water-power dams in North America was built in 1634 on the Neponset River in Massachusetts. The power was used to operate a grist mill, a sawmill, and a powder mill. With the growth of the factory system there was increased construction of water-power plants, but their usefulness was limited because power could be transmitted only short distances by mechanical means such as shafts, ropes, belts, pulleys, and gears. This limitation was overcome in 1882 when the world's first hydroelectric central station was built in Appleton, Wis. Long-distance transmission of electric power started about 1900. After that development the proportion of water power in the United States increased from about one-eighth to one-quarter. Total capacity of all hydroelectric power plants in the United States by the mid-1950s was nearly 30 million horsepower, estimated to be equivalent to the work accomplished by 15 servants working for each man, woman, and child in the nation. Similar development occurred in Canada and other countries.

THE TEN HIGHEST DAMS IN THE WORLD

Name	Height (in feet)	Type	Location	Purpose[1]
Grand Dixence	912	Concrete arch	Switzerland	P
Mauvoism	746	Concrete arch	Switzerland	P
Hoover	726	Concrete arched gravity	Ariz.-Nev.	F-I-P-R
Bhakra	680	Concrete gravity	India	I
Shasta	602	Concrete gravity	California	F-I-P
Tignes	591	Concrete arch	France	P
Hungry Horse	564	Concrete arched gravity	Montana	I-F-P
Grand Coulee	550	Concrete gravity	Washington	I-P-R-F
Ross	545	Concrete arch	Washington	P
San Guistana	500	Concrete arch	Italy	P

Data chiefly from U.S. Bureau of Reclamation

[1]P, Power; F, Flood Control; I, Irrigation; R, River Regulation.

Nearly 2000 dams in the United States produced electric power in the mid-1950s. Some of the more important dams constructed solely for hydroelectric power production are the 912-foot Grand Dixence and the 746-foot Mauvoism dams in Switzerland, the 545-foot Ross Dam and 386-foot Diablo Dam, both concrete arch dams serving Seattle; the 330-foot Alder Dam, a concrete arch dam serving Tacoma; the 328-foot rock-fill Salt Springs Dam in California; the 313-foot concrete arch Aerial Dam in Washington; the 275-foot Lake Spaulding Dam in California; and the 275-foot rock-fill Dix River Dam in Kentucky. Many outstanding dams are multipurpose structures that include power generation among their functions. Some of these are the 726-foot concrete arched-gravity Hoover Dam in Nevada and Arizona, the 602-foot concrete gravity Shasta Dam in California, and several Tennessee Valley Authority dams. See ELECTRIC POWER; WATER POWER; SHASTA DAM.

Flood Control. United States government participation in flood protection started in 1849 and has continued with increasing intensity under the U.S. Army Corps of Engineers. Outstanding examples of dams exclusively for flood control are those built by the Miami Conservancy District in Ohio after the Dayton flood of 1913. Los Angeles also has a number of flood-protection dams. The 425-foot rock and earth-fill Mud Mountain Dam in Washington and the 230-foot rolled earth-fill Oahe Dam in South Dakota were constructed only for flood control. Most flood and debris protection in this country, however, is provided by multipurpose dams. The nation's many miles of levees also give flood protection. See FLOOD.

Multipurpose Dams. The function of a multipurpose project is to secure the best possible use of the water available from a given watershed. This includes various combinations of river regulation, flood control, navigation improvement, power production, water supply, stream-pollution control, and recreation-area development.

Great impetus was given multipurpose projects in 1928 by the Boulder Canyon Project Act, which provided for river regulation, navigation, flood control, irrigation, and power. The Tennessee Valley Authority Act was the first legislation providing for development of an entire river valley on a multipurpose basis. The resources of the Missouri River Valley also have been made more useful by a far-reaching multipurpose development (about one-sixth of the area of the United States is included in this valley). The project involves all the objectives of multipurpose dams. Most large dams constructed in this country in recent years are multipurpose structures, including the Hoover, Shasta, Hungry Horse, Grand Coulee, Fontana, and Anderson Ranch dams.

HISTORY

Dam construction was carried on in prehistoric times and has continued through recorded history. Ancient dams were built chiefly to store water for irrigation. The Assyrians and Egyptians constructed major dams for this purpose; ruins still exist of one masonry dam built across the Nile about 6000 years ago that stored several million acre-feet of water. A

UNITED NATIONS

Workmen are shown building forms in preparation for the pouring of concrete at the Río Lempa Dam in El Salvador. The project was partially financed by a World Bank loan.

masonry dam with a greater volume than any other known dam, including the modern Grand Coulee Dam, was built in Arabia nearly 4000 years ago. Many ancient earth dams are still in use in India and Ceylon. The Romans constructed good dams, but during the period from about the fifth century until the beginning of the sixteenth century little progress was made in Europe. The first dams constructed in North America were small structures built of timber or of timber cribs filled with rock.

Earth probably was the first material used for dams, but until recent years it was considered suitable only for low dams. After 1920, however, there were great advances in knowledge of the properties and behavior of earth and in application of rational procedures to the design of earth dams. In 1948 two rolled earth-fill dams more than 400 feet high were completed in the United States.

Stone masonry of various types was once used extensively, but it gradually gave way to concrete because of the lower cost, greater speed, and superior structural qualities of concrete masonry. Concrete had replaced stone masonry in American dams by 1916, and marked progress in design has been made since then. However, the heat generated by the cement in setting, and the later cooling of the concrete, result in shrinkage stresses that cause cracking and more than offset the refinements in design. Much effort has been given to reducing these stresses by using low-heat cements, by reducing cement content through better proportioning, by precooling the aggregates and mixing water, by cooling the concrete after placing, and by depositing the concrete in thin layers to permit it to cool before covering with subsequent layers (see CONCRETE). The maximum heights of masonry dams increased rapidly after 1900 from about 300 feet to more than 900 feet. See table.

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DAMAGES, the amount claimed by, or money compensation awarded by a court or jury to, a party for a wrong sustained by breach of contract or the violation of a private right created by law and recognized in a court of common law jurisdiction. The latter violation is a tort, as distinguished from a breach of contract.

The theory or idea of damages is to indemnify or make whole the party who has suffered the wrong, putting him in the same position or condition as he was before he sustained an injury to his person, his rights, or his property, either real or personal. Sometimes it is difficult to place a party in exactly the same position as he was before experiencing the incident which gave rise to his suit for damages; indeed, in some instances no award of damages will recompense the injured party. For example, if the seller of a house breaches his contract to convey it to the buyer, no amount of damages may suffice for loss of that particular house that the buyer was determined to acquire. There may be no other house like it. But the law in such a circumstance does not leave the buyer without a remedy. He may go into a court of equity and compel the seller to convey that particular house to him. That remedy in law is called specific performance.

Damages may be compensatory or punitive, nominal or substantial. Compensatory damages are usually an amount of money sufficient to reimburse the claimant who has been wronged. They are payment for the loss which is the natural, reasonable, and proximate result of the wrongful act complained of, and which a proper degree of prudence on the part of the claimant could not have avoided. For example, the costs of repairing an automobile which has been wrecked in an accident are the compensatory damages in such a case. Besides compensatory damages there may be special damages in the same case. For example, if one sustains personal injuries in an accident caused by the fault of another, the damages sought to be recovered for the pain and suffering of the injured party are called general, but the doctor and hospital bills are considered special damages, those which the law does not necessarily imply that the plaintiff or claimant has sustained from the act complained of.

Punitive damages involve punishment for a wrong. Sometimes they are called exemplary—to show by example—or vindictive. They are assessed by a court or jury in addition to compensatory damages. For example, in an assault and battery case, the jury may find that the defendant maliciously and willfully struck the plaintiff, and will therefore assess as punishment (punitive) and as an example (exemplary) or warning to others who may contemplate wrong a sum of money in addition to the general and special damages awarded to the plaintiff. However, if the plaintiff has suffered no general or special damages or loss of any kind, the assessment of punitive damages becomes a fine or a penalty rather than damages, and the assessment in such a case is in conflict with the theory or idea of damages, that is, putting the injured party in the same position as before the incident. Generally, punitive damages are awarded only in tort cases, that is, violations of private rights created by law and recognized in common law courts. Damages for breach of contract are always nominal or compensatory and usually substantial. However, there is one exception to that general rule, and that is the breach of promise to marry. While the legal action founded on such a breach is founded on contract it is in the nature of an action for a tort or a wrong done to the plaintiff. If it is obvious that the defendant has been actuated by motives of an evil intent wantonly and ruthlessly to humiliate and injure the plaintiff, a court has held that a case is made for the assessment of punitive or vindictive damages, which may operate as a punishment in the interest of society as well as for the doing of a willful personal injury to a fellow mortal.

When one of the parties to a contract causes a breach, but no loss has been sustained by the other party, the party who has sustained the wrong has a cause of action against the breaching party, although he may recover only nominal damages, that is, one cent or one dollar. That is a sum of money that is spoken of, but has no existence in point of quantity. Nominal damages may also result in a tort case, such as slander or libel, where the damage to the plaintiff resulting from the wrong is slight or insignificant, the plaintiff being primarily interested in being vindi-

cated. One of the advantages of a verdict for nominal damages is that court costs, which in some cases amount to several hundreds of dollars, usually attach to the judgment.

Substantial damages are actual compensation for the loss sustained. They may be liquidated or unliquidated. If parties to a contract assess in advance the damages at which they estimate a breach thereof, and make that assessment a part of their agreement, that fixed amount is called liquidated damages. For example, a building contractor may agree with the owner of land that if he does not complete the structure by a certain day, he will pay the owner a fixed sum of money for each day beyond that time as liquidated damages. If, however, the parties to the contract intend to impose a penalty on the one who breaches it rather than to recover the actual loss sustained by way of liquidated damages, a court will not enforce that part of the contract which provides for the so-called liquidated damages. The court is not bound to accept that part of the agreement notwithstanding the fact that the parties have agreed to it, if the court finds that it amounts to a penalty rather than damages.

Unliquidated damages are those which cannot generally be ascertained or determined in advance by any scientific or mathematical method from the information on hand. Such damages are usually considered by a jury from all the proof submitted by the plaintiff and then an assessment is made thereon. For example, the pain and suffering, the temporary or permanent disability, the emotional disturbance, the medical expense, and the possible future loss of time from work sustained by the plaintiff because of an accident through no fault of his own are not susceptible to the fixing of a precise amount in dollars and cents in advance of presentation of all the evidence.

Generally, one who has sustained damages by a breach of contract or a tort has a legal duty to decrease those damages as soon and as much as possible by acting promptly after the breach or injury to remedy the situation. If he does not do so, he will be limited in his recovery of damages to those which he would have sustained had he acted promptly. For example, if an employee is wrongfully discharged, it is his legal duty to seek similar employment elsewhere, thus reducing his damages as much as possible. Similarly, if a person is wrongfully injured in an accident, it is his legal duty to seek competent medical assistance to reduce the severity of his injury.

There are some causes of action created by legislative enactments, both state and federal, that provide for double or treble damages. Some courts have held those provisions to be a penalty for violation of the law, while other courts have said such provisions are remedial. One of those statutes was the Rent Control Act, which provided treble damages for overcharges in rent, that is, charges above the lawful ceiling. Another one of those enactments is the Sherman Anti-Trust Act, passed by Congress in 1890, which provides that "any person who shall be injured in his business or property" by violation of that law, "shall recover threefold the damages by him sustained, and the cost of suit, including a reasonable attorney's fee."

To recover compensatory or substantial damages in any lawsuit, it is necessary to state in the court pleading (the complaint, declaration, petition, or statement of claim) the maximum amount it is desired to be recovered, called the *ad damnum* clause, that is, to the damage. Therefore a plaintiff must state a sufficient amount to cover any possible damages he may prove. Should the proof of damages exceed the amount mentioned in the *ad damnum* clause, the law will limit the judgment to the maximum therein stated. For example, if the *ad damnum* clause states $500 and the proof of damages warrants a verdict of $1000, any damages assessed over $500 will not be sustained.

HERMAN B. GOLDSTEIN

DAMAN. See DAMÃO.

DAMANHÛR, town, NE Egypt, capital of the province of Beheira; on the Nile River delta; 38 miles ESE of Alexandria. The town is on the site of ancient Timenhor, "town of Horus," or Hermopolis Parva, capital of a nome (province) during the Ptolemaic period. Cotton ginning, wool weaving, woodworking, and the manufacture of matches are carried on in Damanhûr. It is a rail and canal terminal in the delta. Pop. 84,983.

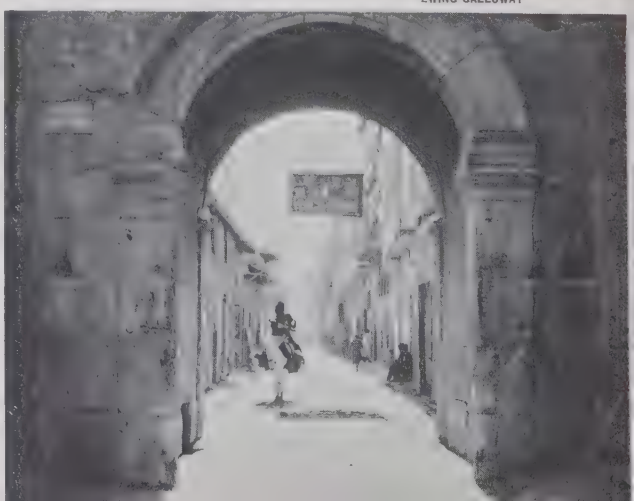
DAMÃO or **DAMAN,** district in Portuguese India, on the W coast of India; on the Gulf of Cambay, an inlet of the Arabian Sea; 100 miles N of Bombay; area 188 sq. mi.; pop. (1950) 69,000. The district consists of three enclaves: Damão, on the coast, Nagar Aveli in the foothills of the Western Ghats, and the area around the city of Dadrá. The capital, Damão, is the leading city and trading center. It exports the district's products: teak, rice, wheat, tobacco, handicrafts, and fish. In the city is an old Portuguese fort and several historic churches. The majority of the people in the district are Hindu and speak the Gujarati language. Damão is governed by a district governor and district council responsible to the governor-general located at Gôa. The Portuguese sacked the city of Damão in 1531 and became established there in 1558. In 1559 the surrounding territory was annexed to Portugal.

DAMARALAND, or Hereroland, region of central South-West Africa, bounded by Ovamboland on the N, the Kalahari Desert on the E, Great Namaqualand on the S, and the Atlantic Ocean on the W. Damaraland is inhabited principally by cattle-raising Bantu peoples. Windhoek is the major town of the region. See SOUTH-WEST AFRICA.

DAMASCUS, or Esh Sham, also Damas or Dimashq, city, SW Syria, capital of Syria and the province of Damascus; on the Barada River; 50 miles ESE of Beirut, Lebanon; pop. (1951) 345,237. The city is located on the eastern edge of the Anti-Lebanon Mountains in the center of the alluvial fan of the Barada River. The A'waj waters the oasis area south of the center of the city. Both are the biblical "rivers of Damascus." Damascus was originally centered around a hill and has expanded in a rectangular pattern in all directions except to the east, where there is a damp lowland. Gardens, orchards, and fields of grain surround the city. Within the city many of the narrow streets are covered, and some of the houses are concealed by drab high walls. Although the architecture is chiefly Oriental there are many remnants of architectural styles left by others who have occupied the city. Damascus is mostly Moslem, but there is a Christian sector in the northeast and a Jewish sector in the southeast.

One of the most famous landmarks of ancient Damascus is "the street which is called Straight." Lined with bazaars, it extends from the eastern to the western city gates.

EWING GALLOWAY



BLACK STAR

Modern buildings, wide boulevards, and luxurious gardens make modern Damascus one of the outstanding cities in the Near East. In the background are the barren Cassion Hills.

Features of Interest. One of the most significant points of interest in Damascus is the eighth century Omayyad Mosque. Originally the site was occupied by a Roman temple, which was replaced by Saint John's Church about 375. After the Arabs took the city in the eighth century, the Christian church was partially destroyed and the mosque was erected. Specialists in mosaic work from Constantinople and workmen and materials from Egypt were brought in for the huge task. The mosque was destroyed by fire in 1164 and subsequently rebuilt. During the following centuries the building was damaged several times. Following a fire in 1893 the structure was restored by the Turkish government. The "street called Straight," associated in the Bible with the conversion of Saint Paul, has remained an important thoroughfare. A covered street flanked by bazaars, it terminates at its eastern and western ends in Roman gateways. The houses of Judas and Ananias are biblical points of interest. The Citadel, built in 1219, is used as a prison and barracks. The tomb of Saladin is of interest. Syrian University, founded in 1924, is located in Damascus.

Damascus is traditionally known as a center of fine craftsmanship and commerce. Its value as a caravan stop declined after the completion of the Suez Canal in 1869. Damascus steel blades and armor were made here until the early fifteenth century. Inlaid wood products, silk and cotton fabrics, silver and gold filigree, saddlery, perfumes, attar of roses, and carpets are products that have been made in Damascus for centuries. Brocades are a product of the twentieth century. The city is connected by rail with Beirut and Amman and with Tripoli, Aleppo, and Baghdad via Homs.

History. Many authorities believe Damascus to be the oldest continuously inhabited city in the world. Damascus was under Egyptian control in the fourteenth and again in the twelfth centuries B.C., interrupted by Hittite domination. The Aramaean kingdom of Damascus, which began to flourish about 1000 B.C., culminated in the capture of Damascus in 733 B.C. by the Assyrian, Tiglath-Pileser III. In the sixth century Persian rule was extended to Damascus, which was a provincial capital until the city passed to Alexander the Great in 332 B.C. After Alexander's death the Ptolemaic dynasty tried to wrest Damascus from the Seleucidae. The city was independent for a while before Tigranes of Armenia conquered it in 83 B.C. About 20 years later Damascus fell to the Romans under Pompey. It remained under Roman rule until the fall of the empire. It was Emperor Theodosius I who built the Christian church here in 375. After serving as a Byzantine provincial capital the city was conquered by the Arabs in 635. The Omayyad dynasty made the city the seat of the caliphate in 661. Damascus became Moslem and the Christian church was destroyed in 705 and replaced by the great mosque. The succeeding Abbassides moved the seat of the caliphate to Baghdad in 750, making Damascus a provincial capital. The rich commercial city began to wane and fell under Egyptian domination in the ninth century. About 1076 the Seljuk Turks gained control of the city and its importance as a commercial center for silk, wool, furniture, and Damascus steel increased. The Christian Crusaders failed in several attempts to take Damascus and in 1260 it fell to the Mongols. Tamerlane sacked the city in 1400 and took the swordmakers and armorers to Samarkand. Damascus passed to the Ottoman Turks in 1516. It remained under Turkish control until 1918. The period was marked by the massacres of Christians and Jews in 1840 and 1860 and the disastrous burning of the mosque in 1893.

During World War I British troops entered the city in 1918 and set up an independent Syrian government. In 1920, however, a French mandate was established and Damascus was made the center of a state, which was joined in 1925 to one centered on Aleppo. The French shelled Damascus in October 1925 and May 1926 when the citizens joined the Druses in a rebellion. British and Free French forces entered the city in 1941 and declared Syria an independent sovereign state with Damascus the capital. French troops again bombarded the city in 1945 but were forced to withdraw by the British. See SYRIA.

DAMASCUS STEEL, or damask steel, is steel with a distinctive streaked or wavy appearance produced by hammering (welding) several pieces of the hot metal together, probably crucible steel imported from India (see CRUCIBLE PROCESS). The name comes from the city of Damascus, whose swordsmiths and armorers used the process from ancient times until the city was sacked by Tamerlane in 1400. Their work, far superior to the products of other smiths, was in great demand.

In later times some gun barrels were made by twisting heated steel bars (or alternate bars of steel and iron) around a rod and hammering them until they welded together and formed a tube; the rod was then removed and the tube finished inside and out. These were called Damascus or twist-steel barrels and were highly prized for the delicate spiral pattern on the polished exterior.

Damascened steel articles are sometimes erroneously called Damascus steel. Damascening is a purely decorative art carried out by inlaying a metal with fine wires of another metal, usually gold or silver. See INLAYING.

DAMASK, a reversible fabric woven with an ornamental Jacquard pattern. Although commonly made of linen for tablecloths, damask is also woven of cotton, silk, wool, or synthetic fibers. Because the warp yarns form a float pattern over the filling, light is reflected in a contrasting pattern and gives damask a characteristic luster. The Chinese are believed to have been first to ornament their silk fabrics in this manner, but damask owes its name to the rich cloths made in Damascus about the twelfth century. White damask of fine flax or cotton yarns is used for formal table linens; colored damask of heavier yarns is used for draperies or upholstery.

DAMASUS I, SAINT, 305?-384, pope, probably of Spanish origin, whose pontificate was marked by discord and bloodshed between his followers and those of Ursinus. He was a friend of St. Jerome and encouraged him in the translation of the Bible known as the Vulgate. His feast day is December 11.

DAMASUS II, eleventh century pope, a native of Bavaria, the successor of Clement II. He died of malaria 23 days after his elevation to the papacy.

DAMBULLA, village, Ceylon, in the Central Province; about 80 miles NE of Colombo. Dambulla is a Buddhist pilgrimage center. Cave temples in the

area date from the first century B.C. The sculptures include a 47-foot reclining Buddha.

DAME'S VIOLET, or dame's rocket, a plant belonging to the mustard family, *Cruciferae*. Dame's violet, *Hesperis matronalis*, is a perennial with conspicuous lance-shaped leaves. Its large lilac-colored flowers have a strong fragrance, especially at night. There are several varieties. Particularly popular is the extensively cultivated double rocket, which bears white, fragrant flowers.

DAMGHAN, town, N Iran, in the Second (Teheran) Province; on the S slopes of the Elburz Mountains; 160 miles ENE of Teheran. The town is connected by rail and caravan route to Teheran. Damghan is in a cotton and grain producing area and carries on trade in pistachio nuts and almonds. The town is believed to be the site of ancient Hecatompylus, a capital of Parthia. Damghan flourished during the Middle Ages, but was ruined during an Afghan invasion in 1723. Tarik Khaneh, the oldest mosque in Iran, erected about the eighth century, is located here. Pop. 12,235.

DAMIANI, PIETRO, ST., 1007–72, Italian ecclesiastic and doctor of the church, was born in Faenza. Noted for his asceticism, Pietro became a hermit at an early age, and strongly influenced the monks in the vicinity of his Umbrian hermitage. He was also a vociferous reformer, and wrote *Gomorrhianus*, a scathing and influential condemnation of clerical worldliness (such as concubinage and the sale of indulgences). In another work he deprecated attempts to apply reason to the study of theology. Damiani was created a cardinal and papal advisor in 1058. His feast day is February 23.

DAMIEN, JOSEPH, better known as Father Damien, 1840–89, Belgian priest and missionary to the lepers, was born in Tremelos. He was sent to the South Seas as a missionary, and in 1873 settled on the island of Molokai, Hawaii, to devote his life to the lepers in the government hospital there. In 1885 he contracted leprosy but continued his heroic labors until his death. His body was brought home to Belgium in 1936.

DAMIETTA or **DUMIAT,** city, NE Egypt; on the Damietta branch of the Nile River, about 8 miles from the Mediterranean Sea; 100 miles NNE of Cairo. Cotton, silk, rice, leather, fish, and dairy products are processed here. There are summer resorts nearby. Damietta (ancient Tamiathis) was held by the Crusaders from 1219 to 1221 and captured by Louis IX in 1249. The following year the city was recovered and destroyed. About 10 years later construction began on the present site a few miles south of the old location. With the construction of the Mahmudiya Canal in 1819 much of the Nile trade went to Alexandria. Pop. 53,631.

DAMMAM. See DHAHRAN.

DAMMAR PINE, or dammar, any one of several tall evergreen trees belonging to the genus *Agathis*, family *Araucariaceae*. There are about 20 species of *Agathis* native to the Southwest Pacific region. The trees are valuable for their abundance of true resin (see RESIN), of value in the preparation of transparent and fast-drying varnishes. The resin of some unrelated trees is also called dammar.

DAMOCLES, Syracusan Greek, a friend of Dionysius I (despot of Syracuse during the earlier part of the fourth century B.C.). Damocles (according to Cicero), having extolled the enviable happiness of Dionysius, was invited by the despot to a feast, where he was surrounded by every imaginable luxury. But over his head was suspended a sword held by a single horsehair, and this, said Dionysius, was the true measure of a ruler's happiness.

DAMODAR RIVER, E India, in Bihar and West Bengal provinces; length about 350 miles. The river rises on the Chota Nagpur Plateau and flows east into West Bengal, where it turns south and joins the Hooghly River about 25 miles southwest of Calcutta. Four multiple-purpose dams control the once treacherous river.

DAMON AND PYTHIAS, two Pythagorean philosophers of Syracuse, celebrated for their bond of faithful friendship. When Pythias was condemned to death for plotting against Dionysius, he asked leave to depart to arrange his affairs; Damon offered himself to be put to death should Pythias fail to return. The latter arrived just in time to prevent his friend's fulfillment of the pledge. The emperor was so impressed by this heroic display that he not only pardoned them, but sought their friendship.

DAMPIER, WILLIAM, 1652?–1715, English seaman and buccaneer, was born in East Coker, Somersetshire. In 1679 he joined a party of buccaneers which crossed the Isthmus of Darien, captured several vessels in the Pacific Ocean, and conducted a piratical war against the Spaniards on the western coast of South America. In 1686 Dampier set out on a voyage around the world. Put ashore on the Nicobar Islands after a dispute with his comrades, he made his way in a canoe to Atcheen. After two years' trading in the neighboring seas, he arrived in England in 1691, where he published his vigorous and interesting *A New Voyage Round the World* (1697). He was later hired by the British government to conduct a voyage of discovery to the South Seas; he explored the western and northwestern coasts of Australia and the coasts of New Guinea and New Britain, giving his name to Dampier Archipelago and Strait. On the return voyage his vessel was wrecked off Ascension and for several weeks he was marooned with his crew on an island. Dampier was master and pilot in the privateering expedition of Woodes Rogers, 1708–11, which rescued Alexander Selkirk. He wrote *Two Voyages to Campeachy* (1699) and *A Voyage to New Holland* (1709). See SELKIRK, ALEXANDER.

DAMPIER ARCHIPELAGO, a group of small rocky islands off the coast of western Australia; 780 miles N of Perth. Enderby Island, the largest, has an area of 21 square miles.

DAMPIER STRAIT, NW New Guinea, separates New Guinea from the island of Waigeo. The strait is about 70 miles from east to west, and varies in width from 20 to 30 miles. Another Dampier Strait is off the northeast coast of New Guinea between the islands of Umboi and New Britain. It is about 15 miles wide.

DAMPING, reducing the motion of swinging or pivoting objects by introducing mechanical or electrical power-absorbing factors. When used with oscillating motion it reduces both the extent of each oscillation and the number of oscillations before the object comes to rest. Damping may be accomplished by the friction of vanes moving in air or a liquid, by the action of a piston in a cylinder filled with air or liquid, by the action of such a cylinder against a piston, by the resistance of springs, and by magnetic attraction and repulsion. The familiar door check that operates by compression of air in a cylinder is an application of damping; another is the automobile shock absorber that uses a piston in a liquid-filled cylinder to reduce the car's bouncing. The moving element of electrical indicating instruments such as the galvanometer is damped to bring the pointer to rest quickly. This is accomplished by vanes on the swinging part or by the magnetic action of eddy currents generated in it (see EDDY CURRENT). Most watt-hour meters have the rotating element damped by eddy currents so that it stops immediately when current flow ceases.

DAMPING-OFF, a parasite-caused plant disease resulting in the sudden wilting and collapse of the young seedling or the loss of viability of the seed. The parasite is usually any one of several fungi. The most economically important fungus is *Pythium debaryanum;* other fungi causing damping-off are *Thielavia basicola*, and species of the genera *Rhizoctonia*, *Sclerotinia*, and *Sclerotium*. The parasite enters the stem of the plant and prevents the flow of water upward

from the root. Damping-off is most frequent and severe in garden crops and seedling trees; it is less destructive to field crops. There is no known treatment for affected plants; preventive measures include careful watering procedures and the sterilization of the soil with chemical compounds or by other means. See PLANT DISEASE.

DAMROSCH, WALTER, 1862–1950, U.S. musician, was born in Breslau, Germany. The son of Leopold Damrosch, 1832–85, conductor and composer, he studied under his father and with Rischbleter. He accompanied his father to the United States in 1871 and at the age of 19 was elected conductor of the Newark (N.J.) Harmonic Society. Later he replaced his father as conductor of German opera at the New York Metropolitan Opera House, and in 1894 organized the Damrosch Opera Company. From 1903 to 1927 he was director of the New York Symphony Orchestra, which he conducted in 1925 in the first symphonic concert radio broadcast. He composed the operas, *The Man Without a Country* (1937) and *The Opera Cloak* (1942), and wrote his autobiography, *My Musical Life* (1923).

DAMSEL FLY, a slender-bodied insect belonging to the order Odonata. The damsel fly's two pairs of conspicuously veined wings, unlike those of its close relative the dragonfly, lie parallel to the abdomen when the insect is at rest. Another notable difference is its feeble power of flight. On the upper surface of each wing is a structure (nodus), which gives the wing a jointed appearance. A large pair of compound eyes occupies most of the head. The species found in temperate climates are generally plainly colored, while those of the tropics display many hues. The damsel fly lays its eggs within logs or the stems of aquatic plants, and sometimes beneath the surface of the water. The metamorphosis (see METAMORPHOSIS) is incomplete and the young insects are well adapted to their aquatic existence. Both the young and the adults feed on other insects.

DAN, town, NE Israel; near the headwaters of the Jordan River; about 50 miles NE of Haifa. Dan is a collective settlement primarily engaged in agriculture with some shoe manufacturing and trout rearing. The modern town was founded in 1939 just south of the biblical settlement of Dan, or Laish. It marks the northern limit of Old Testament Palestine; thus the expression, "from Dan to Beersheba." Pop. (1950) 406.

DANA, CHARLES ANDERSON, 1819–97, U.S. journalist, was born in Hinsdale, N.H., and was largely self-educated until he entered Harvard University in 1839. Forced to leave Harvard because of poor eyesight, he taught for five years at Brook Farm. Having done some writing, he became assistant editor of the *Boston Daily Chronotype* in 1846 and within a year became city editor (at a starting salary of $10 a week) of Horace Greeley's *New York Tribune.* For the next 15 years he was second only to Greeley in guiding the paper's course. Travel, writing experience, and his development as an editor made him a well known journalist at the start of the Civil War. Differing with Greeley, Dana favored an aggressive war policy and in 1862 was forced to resign from the *Tribune.* He entered the War Department as a special aide to Secretary Edwin M. Stanton, to whom he reported on the progress of the war directly from the front. He advised Stanton and Lincoln on the capabilities of various generals and was made assistant secretary of war in 1863. He is credited with furthering the careers of both Grant and Sherman. Resigning in 1865, he acquired the *New York Sun* in 1867 and built it into an outstanding publication through concise, sparkling reporting and emphasis on human interest. Dana had broad intellectual interests and as a molder of public opinion aided many worthy causes, but there was a strain of cynicism in his make-up. Politically he was often independent, but he allowed personalities to influence his views unduly. His works include *The Art of Newspaper Making* (1895) and *Recollections of the Civil War* (1898); he also projected and edited the *American Cyclopaedia.* E. B. LONG

DANA, FRANCIS, 1743–1811, U.S. jurist, was born in Charlestown, Mass. He was a delegate to the Continental Congress, 1776–78, where he served as chairman of the committee to reorganize the army. In 1785 he was appointed a justice of the Supreme Court of Massachusetts and in 1791 became chief justice.

DANA, JAMES DWIGHT, 1813–95, U.S. geologist, was born in Utica, N.Y. A geologist on the Wilkes Exploring Expedition to the Pacific, 1838–42 (which provided material for several scientific papers), he was editor of *American Journal of Science* after 1840, and a professor at Yale University after 1849. His works include *Corals and Coral Islands* (1872) and *Characteristics of Volcanoes* (1890).

DANA, JOHN COTTON, 1856–1929, U.S. librarian, was born in Woodstock, Vt. As librarian of the Denver Public Library, 1889–98, he enlarged it from 2000 to 40,000 volumes, opened the shelves to the public, and organized the first children's department. In Newark, N.J., 1902–29, he originated the first public library picture collection. He wrote the standard textbook, *Library Primer* (1896), *Libraries: Addresses and Essays* (1916), and *Art Is All in Your Eye* (1927).

DANA, RICHARD HENRY, 1815–82, U.S. author, was born in Cambridge, Mass. Poor health and failing eyesight caused him to leave Harvard University when he was a sophomore and, hoping to improve his physical condition, he shipped as a seaman on a voyage to the Pacific Coast. Dana's experiences and observations of the often cruelly hard life of the merchant sailors of his day are vividly recorded in journal form in *Two Years Before the Mast* (1840). It was the author's hope that the book might serve in some measure to "redress the grievances and sufferings" of his fellow sailors. The book was an immediate success and soon joined the ranks of classic sagas of the sea. After his return from the voyage Dana resumed his studies and was admitted to the Massachusetts bar. He became an authority on maritime law and published the *Seaman's Friend* (1841), a manual dealing with the rights and duties of masters and sailors. Dana was also one of the founders of the Free Soil party, and as an Abolitionist acted as counsel for escaped slaves. Later he held several minor diplomatic posts. Dana also wrote *To Cuba and Back* (1859), and edited Wheaton's *Elements of International Law* (1866).

BETTMANN ARCHIVE
Richard H. Dana

DANAË, in Greek mythology, the daughter of Acrisius, king of Argos. After an oracle prophesied that Danaë would some day give birth to a son who would kill Acrisius, the king shut his daughter into a tower; but Zeus, having observed Danaë's great beauty, visited her cell in the form of a shower of gold, whereupon she conceived a child, Perseus. Acrisius, whose feelings would not permit him to murder outright the young mother and her child, shut them in a chest and cast it into the sea. They were saved, however, and Perseus eventually returned to Argos and accidentally killed his grandfather, thereby fulfilling the oracle's prediction. See PERSEUS.

DANAÏDES, in Greek mythology, the daughters of Danaüs, 50 in number, who married the 50 sons of Aegyptus. In obedience to their father, all of the Danaïdes slew their husbands on their wedding night, with the exception of Hypermnestra, who spared her husband Lynceus. Their descendants were the Greeks (Danaï). See AEGYPTUS.

DANAKIL or **DANKALIA,** arid region, NE Ethiopia, SE Eritrea, and French Somaliland, about

350 miles from NW to SE and over 200 miles in width, bounded by the Red Sea on the N and E, the Gulf of Tadjoura on the SE, and by escarpments of the Great Rift Valley on the S and W. Danakil lies largely within Ethiopia. The region consists of volcanic mountains more than 7000 feet in elevation bordering the Red Sea, with lowlands and basins on the interior. Parts of the basin area are below sea level and contain numerous saline lakes. The Awash is the principal river of Danakil. The region is mainly inhabited by pastoral nomads.

DANAÜS, in Greek mythology, was the son of Belus (Baal) by Anchinoë, daughter of the Nile. Danaüs was made ruler of Libya while his twin brother Aegyptus ruled the land of the Melampodes, naming it Egypt, after himself. Danaüs was the father of 50 daughters, the Danaïdes, and Aegyptus had 50 sons. After the death of Belus the twins quarreled over their legacies and Danaüs was forced to flee Libya with his daughters. They sailed to the Peloponnesian Islands and took refuge at Argos, where Danaüs, supported by the goddess Athena, shortly announced that he had been divinely chosen to rule that kingdom. The king of the Argives was persuaded to abdicate peacefully and Danaüs was crowned in his stead. Meanwhile, the sons of Aegyptus, in pursuit of the Danaïdes, whom they wished to marry, landed at Argos and asked Danaüs to consent to a mass wedding. He agreed, and paired off the couples by drawing lots, but supplied each of the Danaïdes with a sharp pin, to be concealed in her hair. At midnight each girl, with the exception of Hypermnestra, stabbed her husband through the heart. Lynceus, sole surviving Aegyptian, later killed Danaüs and ruled in his stead. Hypermnestra persuaded Lynceus to spare the lives of her sisters, who were forced to carry water in sieves to irrigate Argos' once-arid land.

DANBURY, city, SW Connecticut, county seat of Fairfield County; on the Still River; the New York, New Haven, and Hartford Railroad; and U.S. highways 6, 7, and 202; 19 miles NW of Bridgeport. The hat industry, established here in 1780, brought early prominence to Danbury as a manufacturing center. Other products manufactured here include surgical instruments, bearings, chemicals, paper and wooden containers, and dairy products. The area was settled in 1684 and incorporated as a city in 1889. During the American Revolution Danbury was a military supply depot. British and Loyalist troops led by William Tryon raided and burned the town in the spring of 1777. The city is the seat of Danbury State Teachers College and a federal correctional institution for short-term male offenders. Pop. (1950) 22,067.

DANBURY HATTERS' CASE. See Boycott.

DANBURY STATE TEACHERS COLLEGE. See Colleges and Universities.

Established in Danbury late in the eighteenth century, hat manufacturing is still a leading industry, employing more workers than any other single industry in the city.

CONNECTICUT DEVELOPMENT COMM.

RAPHO-GUILLUMETTE

DANCE

"Whosoever danceth not, knoweth not the way of life; dance is the mother of the arts."

DANCE, the active, organized response of the human body to rhythm, usually but not necessarily of a specifically musical nature (see Music). As a response to rhythm, dance movements are understood to be in terms of the rhythm; this does not mean that a dancer need follow the rhythm, only that he be aware of it: given this awareness, his dance may be set against the beat of the music in such a way that dance and music together will produce a polyrhythmical effect. See Rhythm.

Animal "Dancing." Dance is uniquely a human activity, and as properly understood is not found among animals. Havelock Ellis, Curt Sachs, and many other writers following their lead assert that dancing preceded man and that it is an instinctive, natural activity to be found on all levels of animal life. Evidence in support of this thesis is meager, however. During the nineteenth century particularly, travelers newly returned from India and other inaccessible parts of the world reported having seen the famous elephant dance and the like, but such stories are unsubstantiated. Even if such accounts were true, movements of the elephants as though they were dancing is irrelevant insofar as response to rhythm is concerned.

Some twentieth century psychologists have tended to identify dance almost completely with kinesthesia, the muscle sense in man and animals. Stretching in man or animal however, although it produces pleasure and satisfaction in some kinesthetic way, is not dancing. Historical and anthropological evidence suggests that man from earliest times regarded dance as one of the qualities that separated him from the lower orders of animal life. To tribal man, two human activities that distinguished him from the animals of the forest were language and dance. Some scholars have suggested that human speech developed out of gesture, which is to say, out of dance. Dance may well be the first of the arts and has been called mother to the arts.

The Essence of Dance

Tribal Dance. Tribal life in every aspect was essentially ritualistic. Every word spoken was considered vitally and supremely important; women, at first, were not allowed to speak at all, and men weighed their words and spoke slowly and carefully because to speak the wrong words was to offend the spirits. It was presumed that it was not really the man who spoke, but some power above the man speaking through him, and the speaker had to transmit correctly the words of the spirit. So too with dance —the man did not dance: he *was danced*. Inspired by the spirits, he gave expression to their dance. And the musicians of the tribe—beating on sticks, pounding hollow trees, or shaking dried gourds—were also thought to be instruments of the spirits. Students of tribal dance sometimes speak of this aspect of dance as role. Each person of the tribe had his role in the ritual of dance, just as each person permitted to speak was careful to do so only in terms of his role in the life of the tribe. There were no spectators. Those not making music or moving to it witnessed it: they too performed in an official capacity.

All tribal dance was religious ritual, and since every aspect of existence was conceived in religious terms, there were many spirits and many dances. Courtship, marriage, the hunt, war, planting, harvest, the changing of seasons, sunrise, sunset, rain, thunder, lightning—all these and more called dance into being. Under the all-seeing eyes of the totem pole, representing the graves of ancestors who had become spirits in their own right, the tribesmen were danced, the musicians were played, the watchers witnessed. Dances were enacted under the most exacting circumstances: a special place was set aside for dancing; special costumes, including tattoos, cosmetics, and masks, were worn for the purpose of dramatizing the fact that a man who danced was, quite literally, not himself. As the spirit entered him he became totally one with his role and had no existence as an individual whatsoever. Innovation was forbidden and if one night's dance differed from that of another, it was the spirits who had improvised, not the men who wore the masks. Many modern observers of tribal dance have assumed that the dancers viewed their activity objectively, that they danced as individuals, and that the dances themselves were improvised and random responses to the drums and other percussion instruments (including the slapping of hands on thighs, shouting, and screaming). Tribal dances, however, were highly formalized. Penalties for violations of tribal rules of all kinds were the most extreme conceivable so that improvisation in dance, as well as in the other arts, became an important factor only as the concept of the free individual with a need to express himself became an acceptable theory of human nature.

Transformation of the Dance. Through the centuries dance has been transformed into either an art or a pleasurable pastime and is no longer a sacred ritual to be performed in a spirit of awe and circumspection. It is almost entirely secularized. In tune with the development of the idea of individuality dance became an art in the sense that through it an individual might express his emotions, thoughts, and feelings, while nonparticipants might view the entertainment as spectators. In the theater of ancient Greece, where the nonparticipating third line watched, dance (with drama, which grew out of it) still was ritualistic in mood. But it was already a diluted ritualism since the spectators, while they remained serious in demeanor, no longer participated. As Greek tragedy and comedy developed and grew more popular, often featuring dance as part of the production, dance and drama became art more than religious celebration.

WESTERN WAYS FEATURES

Navaho Fire Dancer

Meantime, dance had given birth to, or at least had nurtured, most of the other arts. Architecture originally consisted of designing areas and buildings for movement (dance). Painting was originally said to be an adjunct to architecture, although some historians trace painting to the use of cosmetics; in either case, dance was the ultimate occasion for painting. Scholars have perennially disputed whether dance or music came first. If music is taken to include purely percussion effects, with little or no emphasis on melody or harmony, it seems likely that music and dance came into being almost simultaneously. Like dance, each of the arts was at first regarded as sacred and infinitely serious and only later became objectified as a play form with professionals doing and others passively or actively watching or listening.

Tribal Survivals in the Dance. Despite the comprehensive transformation of all the arts, especially dance, from sacred to secular in significance, the essence of dance remained the same from primordial forest glen to twentieth century ballroom. Even the specifically religious character of the dance was not entirely lost over the centuries. Religious ceremonial (such as the Mass) is in a sense dance, with the four original tribal elements of special place, special dress, role, and rhythm all present in greater or lesser degree, depending upon the denomination and the

Wakamba dancers and their musicians, right, reach a vigorous climax in a performance. The Wakamba or Kamba are a Bantu people who live in Kenya in British East Africa.

KENYA DEPT. OF INFORMATION

type of service being enacted. In a religious service there are no spectators, but witnesses as in the tribe. After 1940 in the United States, Mrs. Chester Fiske (wife of a Congregationalist clergyman) inaugurated the rhythmic choir movement, an attempt to remind modern man that Christian ceremonials in the first 500 years of the Christian Era were danced. Periodically in the history of Christian countries there were outbursts of the so-called dancing mania—seemingly hysterical dancing by persons under the influence of a sense of religious ecstasy. The best documented instance began in Aix-la-Chapelle in 1347 and within a few weeks had spread throughout the Netherlands. In the United States, fundamentalist gospel singers sing what are called spasmodic spirituals, which often have the effect of putting many members of a church congregation into a state of such religious ecstasy that they dance and hop up and down the aisles of the church, or writhe and twitch in time to the music while remaining seated.

The tribal conditions for dance remained evident in twentieth century secular dance, too, however much transformed such dance appeared to be on the surface. Always a place was set aside, at least temporarily, for the dancers; dress was adapted to the occasion whether formal dance or folk music festival; role remained important, as in ballroom dancing where each sex had distinctive footwork to keep in mind, and where there were musicians, dancers, even a stag line. Rhythm played its part too, since without it there could be no dance at all.

Clearly dance has been no minor episode for mankind. Insofar as historians, archaeologists, and anthropologists can determine, dance is the universal art.

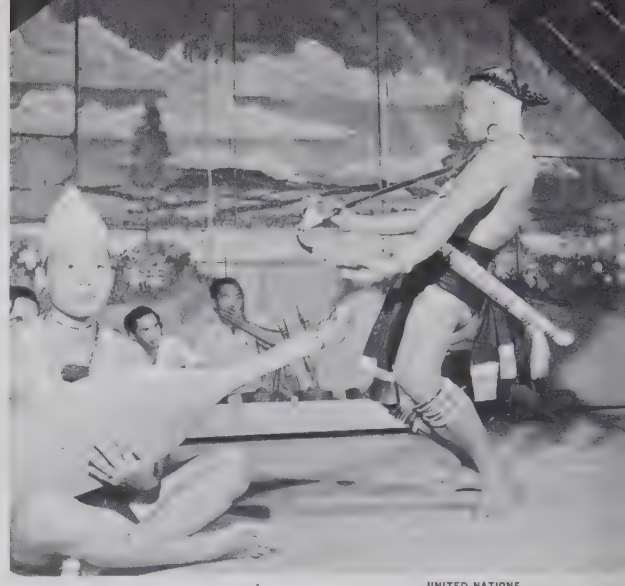
Development of Dance Around the World

Oriental Dance. Throughout the Orient the dance has been considered one of the highest accomplishments of man. It has been an integral part of religious ceremony, a highly developed theater art (almost inseparable from the drama), and one of the major forms of artistic expression for the common folk.

The highly formalized but superbly expressive gesture dance (*nryta*) originated in India thousands of years ago. Mimetic (mimicking) ritual dance is mentioned in the *Vedas*, and the god Siva is called Lord of Dancers. *Nryta* established a veritable language of gestures, in which various emotions are expressed by specific body movements. The movements are largely of the upper trunk (the dancer often remains seated), with hands and arms playing the most important role. India is rich in folk dances, too—the Santal courtship dances; the devil dances of the south; and, probably most familiar to Westerners, the nautch dances of the women of Marwar, with their clanking anklets and tinkling bell jewelry. In addition to these are the vast number of seasonal festival dances, in themselves uniquely beautiful art forms.

A young Balinese girl wears an elaborate headdress and sarong as she performs the movements of one of the intricate dance forms for which the people of Bali are noted.

DANCERS OF BALI



UNITED NATIONS

The music and movements of the dance performed here in front of a painted backdrop by a Kayan from the uplands of Borneo probably originated in some rituals of the tribe.

The Javanese *wayang-wong*, rigidly orthodox in form, has been called the most perfectly finished theater piece in the world. A dance drama closely akin to India's, this form was an outgrowth of the ancient *wayang-topeng*, a ritual dance of ancestor worship using masked dancers; and the *wayang-kulit*, a shadow play using puppets. The *wayang-wong* is characteristically performed with very slow, stiff-backed movements to the accompaniment of a *gamelang* orchestra of flutes, xylophones, and gongs. A narrator (*dalang*) directs the music and chants the story of the dance.

In Bali the dance was an important part of daily life and it has been said that every Balinese is a dancer. This was perhaps the reason that even the classical Balinese dance was more lively and vigorous in form than many of the other oriental dances. Births, deaths, marriages, religious and patriotic holidays—every important event was celebrated with a dance festival in which trained dancers performed for the people, and the people themselves performed. Among the best known (to the West) of the traditional Balinese dances was the beautiful *legong*, performed by two girls dressed in elaborate sarongs and headdresses.

Both Siam and Cambodia adopted the Indian epics *Ramayana* and *Mahabharata* as inspirations for their own dance dramas; but the Indochinese dance was less earth-bound, and greater movement of the lower body was permissible. In Cambodia the most promising dancers were housed and educated by the royal family.

Little is known of the origins of the classic theater dance of China, but it must have required centuries of refinement to have arrived at the purity of form it displayed by the time of the T'ang dynasty, 618–907. The classical Chinese theater dance employed the utmost subtlety of gesture and movement in its expression; it also utilized color to a greater degree than any of the other oriental dances. Costume colors were used to indicate attributes of the wearers; thus yellow indicated royalty; red, an honorable man; white, youth. Color was also used in masklike face painting; for instance, yellow indicated craftiness and white, wickedness. Thus an actor-dancer with a white-painted face and a yellow robe was a wicked ruler. See Chinese Music.

DANCE

Siamese dance and drama require early training to attain the infinite grace that is necessary to perform the intricate gestures and postures.

Many modern dancers received their early training under an American pioneer of the art, Ruth St. Denis, celebrated for imaginative dancing.
NEW YORK PUBLIC LIB.

MUS. OF CITY OF NEW YORK

Although limited in their dancing, the Florodora Sextette of chorus girls from the play *Florodora* were a hit of the theater in 1900.

The Japanese Kabuki drama, upper left, a dance of religious origin in modern form, has limited repertoire and traditional steps and costumes.
S. HUROK

One of the patterned movements of modern dance is here interpreted by José Limón and Pauline Koner in a modern dance drama, *The Visitation.*
ROBERT L. PERRY

One of the earliest known dance forms of ancient Japan was the *gigaku*, a religious masked dance. The *dengaku* was a rustic equivalent of the majestic *Noh* dance drama. Dance was also an intrinsic part of the Kabuki theater. This form employed much of the *Nihonbuyo* (classical) repertoire of pantomime dances.

From the time of Marco Polo the Western world has been fascinated by the exotic East. Preoccupation with things oriental was shown in the turbans and caftans of pre-Renaissance Venetian dress, in the *chinoiserie* of seventeenth and eighteenth century French decorative arts, in English furniture design (Chinese Chippendale), in music (*Turkish Rondo*, *Abduction from the Seraglio*, *Madame Butterfly*), in painting (Bellini, Delacroix), and in the dance. Many of the favorite ballets of the French and Italian courts had oriental themes, escapes from harems and slave markets (with nautch dancers) being especially popular. Egyptian dancers (few of them actually from Egypt) were popular during the Victorian era, and no carnival was complete without its "genuine East Indian dancers" in their gauzy trousers (never worn in India). The American interpretive dancer Ruth St. Denis pioneered in bringing Eastern dances with an authentic flavor to the United States; her first production in this medium, *Radha, a Hindu Temple Dance*, was tremendously popular in both the United States and Europe and started a rage of imitative oriental dancing. Later in the twentieth century the United States saw authentic oriental dances: Uday Shan-Kar brought his company from India, the dancers of the Kabuki theater came from Japan, Tei Ko performed her concert versions of the classic Chinese dance, and Sai Shoki brought the gay folk dances of Korea.

Antiquity. In Egypt vastly complex ritual dances had in pre-dynastic times already become part of religious rites and were performed sometimes publicly, sometimes within the temple. Egyptian peasants continued to dance the fertility rites of their tribal ancestors but the aristocracy had abandoned the dance to the peasantry and to professional entertainers. Temples maintained groups of dancers as a special class, as did the court of the Pharaoh. Egyptian temple and court dancing was characterized throughout dynastic history by great austerity of movement and stiffly formal gestures. Since Imperial Egypt detested all tribal ways (and banned many of them, such as the tattoo) the restraint was probably a reaction against the more exuberant tribal dance. Later the foreign dances of imported entertainers were found to be acceptable, and the softly undulating movements of Asiatic slave-girl dancers became part of, and eventually eclipsed, the Egyptian stick dance, in which the movements were stiff and angular or stick-like.

In the choral dances of early Greece, 700–600 B.C., especially the dithyramb in honor of the god Dionysus (the life-giver, who yearly—like Egypt's Osiris—grew, flourished, faded, and died only to rise again in the rebirth of spring) can be seen the beginnings of drama. A leader garbed as Dionysus was surrounded by 50 choral dancers, who with him interpreted this life cycle, imitating his movements, singing an accompaniment to his dancing and beating rhythm, at first with foot stamping and hand clapping, later with percussive instruments. The climax of the year was the grape harvest, which was celebrated with a joyous festival in honor of the god. The dancer Dionysus and his troupe were carried to the festival in a *carrus navalis*, a ship on wheels (thus the word carnival).

In Rome, especially after the Roman conquest of the Greeks, the patricians were so fond of dancing that they imported Greek dancing masters and it became fashionable for the sons and daughters of nobles to attend their classes. Dancing became a necessary social accomplishment, so necessary in fact, that Cicero was moved to the sour remark "Nemo fere saltat sobrius" (no sober person would dance). Religious festivals were celebrated in much the same way as the Greek rites were, but the Roman Bacchanalia (in honor of Bacchus), and the exotic excesses accompanying the Lupercalia (purification festival) degenerated into orgies. With Christianity came restrictions on the dance. The early Christians danced much as their pagan forebears had, but the hierarchy frowned upon an art form so intimately connected with pagan religions. The dance returned again to the province of the priesthood, with its ceremonial processionals and colorful pageantry. But so basic a means of expression could not long be denied; mimetic dance for religious purposes once again foreshadowed dance as entertainment, particularly in the courts of the ruling classes. Among the common people ostensibly religious festivals were celebrated in decidedly secular ways, with pantomime, juggling, and a return to choral dancing in the pre-Lenten carnivals reminiscent of their bacchanalian ancestry.

European Dance. Except for a few scattered references, little is known of dancing in the Middle Ages, but during the fourteenth century there came a reaction against clerical suppression of the dance. The French and Italian courts saw the beginnings of what must be considered modern dancing—purely secular dancing for dancing's sake—in the stately processionals to musical accompaniment and the *caroles* in which men and women joined hands in dancing games. Pantomime played an important role in these dances, most of which were mimetic wooing dances. Catherine de Médicis, herself an accomplished dancer, introduced to the French court in the sixteenth century the first formal ballet, *Le ballet comique de la Reine*, with choreography by Baltazarini. Highly successful and much imitated, this spectacle ballet is generally credited with being the prototype of formal ballet as it was later presented in theaters throughout the Western world (see BALLET). Catherine also introduced the lively Italian *volta* to the courtiers, and the energetic (and erotic) branle, of which the Canon Arbeau said in 1588, "It certainly should be a good dance to make oneself warm in winter!" The branle was known in England as the brawl, a round dance in which any newcomer could join; it began with a slow movement, gradually became faster and more gay, ending with all the couples rushing to the center of the circle.

Later the pavan, a formal procession type of dance, and the stately saraband were imported from the Spanish court. The courante, a dance performed with small jumping steps and much bowing and curtseying also became popular; it was the ancestor of the minuet. The gavotte, at first little changed from its robust peasant form, was immensely popular, perhaps because it consisted mostly of hopping and kissing; later it was refined so that the ladies received nosegays instead of kisses.

Other popular European dances of the seventeenth and eighteenth centuries were the *chaconne*, the Bavarian *Ländler*, the Italian saltarello, and the Spanish *passacaglia*. Travelers to foreign countries brought them back to the French court, where they were altered to a more gentlemanly and ladylike form, after which they found their way back to the countries of their origin. But even when they were refined, many of these dances were met with shocked indignation by moral arbiters of the day.

At a social gathering, several dances usually followed each other as a suite of alternating slow and fast movements; at first each of these dance forms was performed to a specific piece of music, which made for a certain monotony. It was later discovered that different melodies could be set to the basic rhythms of a dance, and composers vied with each other in producing new settings for the old forms. Many dance rhythms and forms were incorporated into the serious compositions of later composers. Whether or not the *bourrées*, *gigues*, and *passacaglias* of Johann Sebastian

DANCE

The bridal round, as it was once called in Germany, was a form of round dance. *The Wedding Dance* is by Pieter Brueghel the Elder.
DETROIT INST. OF ARTS

THEATRE ARTS PRINTS
The torch dance, the concluding portion of the wedding ceremonies in ancient Prussia's royal court, was further used as a token of esteem.

***Le rond,* with one or all the dancers moving in a circle, was one of the chief figures of the popular cotillion of the nineteenth century.**
MUS. OF MODERN ART

During the mid-twentieth century the waltz was still popular in its modified forms. Ballroom dancing was widely enjoyed as adult recreation.
LIB. OF CONGRESS

MUS. OF MODERN ART
In the latter part of the nineteenth century the leading dance was the waltz, credited with once again giving real character to dancing.

Bach were actually written as dance music, they were eminently danceable, as were the minuets and rondos of Mozart. In one of his letters from Prague, 1787, Mozart wrote: "I went with Count Canal to a rustic ball . . . and saw with wholehearted pleasure how these people jumped around with such sincere enjoyment to the music of my *Figaro*, which had been turned into all kinds of *contres*."

During the eighteenth century the epitome of courtly elegance in dance forms was the minuet; no lady or gentleman worthy of the name could do less than strive for perfection in the performance of its intricate, dignified measures. In its ceremonial bows and curtsies, its show of gentlemanly gallantry and ladylike coyness, covert glances, and advancing and retreating movements, it was reminiscent of an ancient tribal dance of courtship, albeit much refined and stylized. In the minuet there was none of the wild abandon that had characterized some adaptations of peasant dances during the previous century; it was a dance of dainty movements wherein, after executing numerous complicated figures, the dancers arrived at their original positions. Rameau, in his *Le maître à danser* (1725), gives some of the most explicit directions for the performance of the minuet.

Brought to perfection during the period preceding the French Revolution, the minuet died with Marie Antoinette and her entourage; the new society of a practical bourgeoisie had no time for its mannered intricacies. For a time there was a return by the bourgeoisie to peasant-style *contredanses*, but these were soon overshadowed by a modified *Ländler*, the waltz.

The waltz, a "turning" dance in three-quarter time, was probably the most enduringly popular dance of the nineteenth century. Of German origin, it was first performed in Paris at the Opéra in 1793, later appearing in English ballrooms (where it was at first greeted with hoots of derision) in 1812. The French accused the English, justly or not, of "pretending to waltz by occasionally pushing one's partner backwards during a leisurely stroll about the ballroom." The waltz signaled the first break from group participation dancing to couple dancing, with a man and woman commencing the dance as partners and continuing in that fashion throughout. The tuneful, if banal, melodies of Waldteufel and the Strausses did much to popularize the waltz and to establish Vienna as the waltz capital of the world. But the Viennese waltz was of distinctly more sedate and formalized design than the buoyant German original, "*Ach! du lieber Augustin.*" Other popular dances of the nineteenth century were the quadrille, the lancers (invented by the Parisian dancing master Laborde in 1832), and the Bohemian peasant polka. Prague society took the polka to its bosom in 1835, after which, as Mr. Punch remarked, it spread to France, England, and America "like a disease." It was danced in ballrooms, in taverns, and even in the streets; everything fashionable seemed to require a polka name; there were polka gowns, polka hats, polka shoes, polka coffeehouses, and, of course, polka dots. Although short-lived, the polka craze amounted to a mania.

MUS. OF MODERN ART

A Polka Period Piece

Square Dance. The sixteenth century English country-dance underwent several transformations. It was imported to France where it was danced by the aristocracy (who found its ancient choral form charmingly bucolic) as the *contredanse*. The English court copied the French form and called it a contradance. Finally the English country folk copied the contradance, completing a typical cycle of influence and counterinfluence: folk to court and back to folk in modified form.

The dance originally was essentially a "long-ways" dance, with a long line of men facing a line of women; the head couple danced down the line and the rest imitated their steps. Newcomers could join in at the foot of the line and if they did not already know the steps they would learn them by the time it was their turn. The French elaborated this form into squares of four couples each, with more complicated steps and figures. These squares, or cotillions (*cotillons*), were the origin of American square dancing. An American innovation was the caller, who simplified things by telling the dancers what to do, thus making it unnecessary to memorize the whole dance as was necessary in the French form. One had only to learn five or six basic figures and be prepared to dance them with gusto when the fiddler called.

Square dancing became immensely popular among Americans during the War of 1812, when it was considered unpatriotic to do English dances; apparently the form was already looked upon (wrongly) as peculiarly American. But by 1841 *The Ball Room Instructor* of New York had announced that square dances were "obsolete in fashionable assemblies, although they were still popular at provincial balls." English society at the same time found contradances "low." Another dance book of the day reluctantly gave directions for a jig, a hornpipe, and a Money

The caller and the musicians at the microphones, right background, conduct an American group in a square dance, a vigorous dance in which young and old may participate.

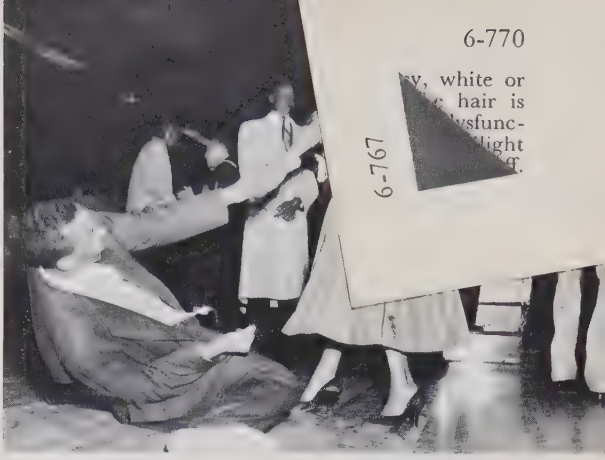
NBC-TV

Musk, but refused to go further, as it said, "these dances belong to a ruder age than ours." William DeGarno in the *Dance of Society* (1875) describes the Virginia reel and the Sicilian circle and "although they were not considered fashionable by the best people," he reluctantly admitted that they were "more or less done all over the country." Meanwhile barn dances to celebrate the raising of a new barn were the big social events of the countryside; but eventually the new-barn excuse was not necessary for a hoedown.

Square dancing returned to popularity in the United States during World War I, perhaps for the same patriotic reasons that inspired it a century earlier. Once again the old form came from the country to the city; again the caller's cries of "ally-mande left; do-si-do; swing your lady" were heard in fashionable ballrooms as well as in country barns. An American Folk Dance Society was formed in 1916. The vogue for square dancing continued through mid-twentieth century. See Folk Dance.

Twentieth Century America. The maxixe, of Brazilian parentage, and the high-stepping cakewalk appeared in the United States before the turn of the century, bringing a new kind of ballroom dancing—a breaking away from the turns and glides of the European round dances, and the beginning of extreme individualism in the dance as well as new forms of dance music. Shortly after 1900 the turkey trot, an exuberant one-step, appeared; following upon its heels came the fox trot, a two-step that made possible a wealth of variations. One of them was the shimmy, a strange little dance performed with toes together and heels apart and much shaking of shoulders and hips. After World War I the frenetic Charleston appeared, and in 1926 came the black bottom, a mixture of glides, turns, stamps, kicks, and leaps. In contrast to the monotonously whirling waltz and the cloyingly bouncy polka, these dances and their successors were revolutionary in form, and were danced to music that was revolutionary in its own right. Called ragtime at first (1890–1920), it was later called jass, then jazz, then swing, then re-bop, then be-bop, and then simply bop—but these many names were few indeed compared to the hundreds of dance fads that during half a century caught the fancy of American youth. Perhaps the most notable period, insofar as dance is concerned, was the thirties, when jitterbugs danced the "lindy-hop," the shag, the "Suzy-Q," or just "trucked on down." The dances were sometimes wild, sometimes inhibited, depending upon the current fashion in music. During the ragtime era, public dancing was still relatively sedate, while the very steps and gyrations that everyone did in 1935 were still restricted to low-class establishments. As jazz and swing music became more abandoned, so did public dancing. By 1945, with the appearance of cool as distinct from hot jazz—bop—people danced much less, and the fashion was to appear as unaffected by the music as possible. In reaction against this, the rock-and-roll music and appropriate dancing took hold; actually rock-and-roll (both dance and music) was merely a new name for rhythm-and-blues music, which had existed for 40 years.

The popularity in the United States of dances inspired by Latin American developments in music and dance began with the maxixe and developed into a craze before World War I, when the Argentine tango caught the public imagination. The tango, however, was a complicated dance, difficult to learn and rarely performed well except in exhibitions. Its successor, the Cuban *rumba*, or rhumba, possessed better qualifications for winning lasting popularity. Showy but easily learned, it was performed to properly exotic music, and even in the expurgated form in which it came North it had a daring quality. Although the ballroom rhumba in the United States bore little relation to its Latin American folk original, some of its qualities as a courtship dance were retained, and its exciting rhythms and undulating hip-and-shoulder movements were accepted with wild enthusiasm by the American public. The rhumba continued to be popular through the mid-twentieth century, generally overshadowing such other Latin American imports as the samba, the conga, the mambo, and the "cha-cha-cha," which enjoyed relatively spasmodic popularity.



WIDE WORLD

Improvisation and variation are the rule on crowded dance floors such as this one in Harlem in New York City. Here a young couple responds to twentieth century rhythms.

Theatrical Dance. After its introduction at the court of Catherine de Médicis, ballet developed rapidly as a theater form. There was a period of great creative activity during the eighteenth century and a golden age of ballet in mid-nineteenth century, when the techniques of so-called classic ballet were perfected (see Ballet). But subsequent developments were largely technical and of an acrobatic nature; the form had become so rigid and stylized by the end of the nineteenth century that there was little need for real choreography, and innovations in scenery or costume design were also frowned upon. The ballerina was the star: little deviation was permitted from the pattern of her dancing on *pointes*, costumed in a tutu, with a male partner (usually more of an ornamental support than a dancer), and exhibiting her marvelous facility in the execution of leaps, turns, and arabesques. One ballet was much like another in its solos, duets, and *corps de ballet* routines.

The role played by Isadora Duncan in the liberation of theater dance can hardly be overestimated. Her revolutionary theory that "all expressive movements spring from the soul" (by which she meant the source of emotion) was a return almost to the very beginnings of dance. Isadora's barefoot dancing, her appearance in softly flowing garments, her rejection of acrobatics and unnecessary ornamentation, her insistence upon the use of music as inspiration rather than as mere accompaniment, and her use of the music of Beethoven, Wagner, and Gluck at first shocked and horrified her contemporaries. But she opened the way to a rediscovery of the kind of dance that had been lost to Western civilization for almost 2000 years, and it was not long before her influence made itself felt throughout the dance world. After World War I there were hosts of Duncan admirers, imitators, and successors "interpreting" in barefoot ecstasy; but Isadora was never appreciated in the United States as a serious artist to the degree that she was in Europe.

It was left for a later interpretive dancer, Ruth St. Denis, to create in the United States what, for lack of a better name, was called modern dancing. St. Denis had little technical training but was enormously gifted in the ability to convey emotion through movement. With her husband and dancing partner Ted Shawn, she formed the Denishawn company and school, which taught certain aspects of classical ballet (through Shawn's influence), combined with

NEW YORK CITY BALLET

Dramatic ballet, a development of the twentieth century, is illustrated by Nora Kaye, one of the great actress dancers, and Michael Maule in a scene from "The Cage."

ethnologic dance forms and expressive body movement. One of the Denishawn company's most important innovations was the treatment of the group dance as a symphonic work, with each dancer performing to a specific instrument. This idea was further developed by a Denishawn pupil, Doris Humphrey, who formed her own company with the assistance of Charles Weidman, choreographer of such group compositions as *Candide* (1933). Among other second generation modern dancers who contributed to the development of modern dance were Martha Graham, who brought a stark, angular quality reminiscent of contemporary sculpture to her theater pieces (such as *Primitive Mysteries*, 1931, and *Transitions*, 1934); Helen Tamiris, who used folk themes in her expressive dancing; José Limón; Valerie Bettis; and also Angna Enters, who combined dance and mime into a unique art form.

In Europe one of the most respected exponents of the new dance was Germany's Mary Wigman, one of the first to utilize many hitherto neglected theatrical devices. Wigman added earthiness and body and a new concept of space to Isadora Duncan's abstract ideas. Her pupil Hanya Holm brought Wigman's ideas to the United States and further developed them. Holm's *Trend* (1937) utilized specially recorded music as a background for choral dances.

Important additions to the field of ethnologic dance were provided by several highly gifted Negro performers and creators, among them the anthropologist-dancer Pearl Primus, a highly respected scholar listed among the finest dancers of the twentieth century; Katherine Dunham, who translated extensive research in Caribbean folk dances into an imaginative theatrical form; Asadata Dafora, who adapted native African dances for concert presentation; and Josephine Prémice, another Caribbean specialist.

Meanwhile classical ballet was experiencing its own revolution. The modern forms, at first thoroughly ignored, began to be utilized by a new generation of choreographers who, working within the limits of ballet technique, revitalized and to a certain extent nationalized ballet, freeing it from the Russian stamp. This was done in England by Ninette de Valois and Anthony Tudor; in Paris by Roland Petit; and in the United States by Agnes De Mille, Eugene Loring, Ruth Page, and Jerome Robbins, among others. Such works as Page's *Frankie and Johnny* (1938), Loring's *Billy the Kid* (1939), De Mille's *Rodeo* (1942), and Robbins' *Fancy Free* (1944) came to be regarded as classics of contemporary U.S. ballet: all used American themes and successfully combined classical and modern techniques. Many of the ideas set forth in these ballets were later incorporated into musical comedies such as *Oklahoma!* (1943), *One Touch of Venus* (1944), *South Pacific* (1949), and *Guys and Dolls* (1950). In these musical plays ballet was utilized as an integral part of the action, rather than as a *divertissement*, as it had been in previous musicals. These tendencies were established as standard procedure after 1947–48 on television, which made extensive use of dance in many of its shows. F. D.

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DANCE OF DEATH, Totentanz, or Danse Macabre, an allegorical representation of the supremacy of death over mankind, in which all ages and all conditions of men are represented in a kind of

ART INST. OF CHICAGO

One of the woodcuts in the series *Dance of Death* by Hans Holbein the Younger, depicting satirically the approach of death to a number of persons of differing backgrounds.

dramatic progression. *The Triumph of Death*, painted on the walls of the Campo Santo at Pisa in the fourteenth century, is one of the earliest known pictorial renditions of the theme. The same subject was pictured in the Dominican cemeteries of Basel and Bern. The Dance of Death was, however, primarily a type of mystery play consisting of short dialogues between Death and his followers. In this form it was enacted in or near churches throughout Germany during the fourteenth century. The martyrdom of the seven Maccabee brothers apparently played an important part in the drama, hence the origin of the ancient name *Chorea Machabaeorum*, or *La Danse Macabre*. Many composers have used the theme in their music, as in Liszt's *Totentanz* and Saint-Saëns *Danse Macabre*.

DANDARA. See DENDERA.

DANDELION, a common perennial or biennial weed of the family *Compositae*, dandelion is a corruption of the French *dent de lion* (lion's tooth) and refers to the plant's deeply toothed leaves. Several species have become naturalized in North America and although colorful, are most troublesome weeds. The commonest species is the yellow-headed *Taraxacum officinale*. It is difficult to remove completely because the rosette of deeply notched leaves surmounting the long taproot grows tight to the surface of the soil. Chemical weed eradicators are moderately effective in destroying dandelions, but the best method of eliminating them is the removal of the entire root system before seed production occurs. The flowers are really flower clusters. Each yellow unit of the cluster is a single tiny flower that produces a one-seeded fruit equipped with a cluster of hairs. These hairs aid in fruit dispersal by allowing the fruit to drift in air currents. The leaves of dandelions are often used as salad greens and as a substitute for spinach; a wine is sometimes made from the flowers. The roots are used as a coffee substitute or adulterant. The hollow stem contains a milky juice or latex, the extract of which is used medicinally as a diuretic. Dandelions may grow to a height of 12 inches and the flower heads are 1 to 2 inches in diameter.

BLACK STAR

Dandelion in Seed

DANDIE DINMONT, a highly intelligent, courageous breed of terriers of Scottish origin, differing from the average terrier in having a curved body. The dog has a rough double coat composed of hard and soft hair. There are two distinct colors of the Dandie; the variety known as pepper has a blue-gray to light silver coat; the mustard, an ochre to cream-colored coat. The darker shades in each color are considered more desirable by dog fanciers. The head, covered with a topknot of light, silky hair, is large and full-domed; the ears are pendulous. The chest is deep and powerful, the legs short and muscular. The tail is low set and slightly curved, averaging 3 to 4 inches in length. The Dandie stands about 8 to 11 inches high at the shoulder and weighs 18 to 24 pounds.

MR. & MRS. WILLIAM M. KIRBY

A Dandie Dinmont Terrier

DANDRUFF, the fine, slightly greasy, white or gray scales that are often shed when the hair is brushed or disturbed. Dandruff is a result of dysfunction of the oil-producing glands of the scalp. Slight itching and a loss of hair may accompany dandruff. A family tendency to dandruff is recognized and the incidence is about equal in men and women.

A definite causative germ or other living organism is not known, but there is much to suggest that some kind of infection may be at fault in some cases. Dandruff frequently develops in people who are apparently in excellent health, although it may follow either acute infections or chronic diseases. Constipation, indigestion, a sedentary life, and the wearing of stiff ill-ventilated hats apparently contribute to development of dandruff. See SEBORRHEA.

Although dandruff itself is a mild condition, a doctor's advice is desirable in treatment since dandruff may be a sign of some other ailment. Early stages of more serious diseases of the skin may be mistaken for dandruff. Treatment of dandruff involves both internal measures and external applications. Persons with dandruff are sometimes benefited by a nutritious diet, massage, and by taking various preparations. Open air exercises and sunlight are often helpful. Local treatment of dandruff involves first the removal of the crusts and accumulated fatty material and later the application of stimulants. Sulfur, resorcinol, salicylic acid, and mercury preparations are frequently used in the form of ointments or lotions after the initial removal of the scales. The condition frequently resists treatment and tends to recur unless treatment is continued for weeks or months after the skin appears to be normal. In general there is no one satisfactory treatment for all people with dandruff and it is frequently necessary to try one measure after another. EDWIN P. JORDAN, M.D.

DANDY FEVER. See DENGUE FEVER.

DANEGELD, a tax levied by the Anglo-Saxon and Norman rulers of England, originally for the purpose of paying the Danes to refrain from plundering. The first regular collection of the tax was under Ethelred the Unready about 991. The tax was abolished early in the reign of Henry II (1154–89).

DANELAW, or Danelagh, the land granted to the Danes by their treaty with Alfred the Great after his victory at Ethandune in 878. The general boundary between the Danes and the Anglo-Saxons followed the Thames and Lea rivers, north along a line to Bedford, thence along the Ouse River and Watling Street. Law and custom in the Danelaw differed from the rest of England during the early medieval period. See ALFRED THE GREAT; WATLING STREET.

DANES ISLAND, in the Arctic Ocean, one of the Spitsbergen Islands, off the NW coast of West Spitsbergen. Salomon August Andrée started from Danes Island in 1897 on his ill-fated balloon voyage across the north polar region. See ARCTIC REGIONS.

DANGEROUS ARCHIPELAGO. See TUAMOTU ISLANDS.

DANIA, city, SE Florida, in Broward County, on the Atlantic Coast; on the Seaboard Air Line and the Florida East Coast railroads and U.S. Highway 1; 7 miles S of Fort Lauderdale. Dania is a tourist resort and has a *jai a-lai* frontón and a chimpanzee farm. Pop. (1955 special census) 5680.

DANIEL, central figure in the Old Testament book bearing his name and recording events and visions connected with his life. Daniel is first seen at the time of the Jewish Exile to Babylon (sixth century B.C.), and the book tells how he gained the favor of King Nebuchadnezzar by his wisdom even as a youthful Hebrew captive. He and his three friends were faithful to their God despite a series of tests: his friends were cast into a fiery furnace, Daniel was thrown into a den of lions. Their survival brought official acknowledgement of the superiority of the Hebrew God to Babylonian deities. Daniel had a series of visions which are recorded and interpreted

WALKER ART GALLERY, LIVERPOOL

***Daniel in the Lions' Den*, a painting by Briton Riviere**

in the second section of the book (chaps. 7–12). They are apocalyptic, professing to reveal the hidden things of the future. Those who do not accept the prophetic element in these writings assign to the book a date of about 165 B.C.

In the Roman Catholic Bible are several sections not found in the Protestant Bible record of Daniel's life. These "Additions to Daniel" are: Song of the Three Children (chap. 3:52–90); History of Susanna (chap. 13); Bel and the Dragon (chap. 14). See BIBLE; OLD TESTAMENT; APOCRYPHA; APOCALYPTIC LITERATURE; BEL AND THE DRAGON; SUSANNA, HISTORY OF.

DANIEL, ARNAUD, or **ARNAUT,** or **ARNAULT,** twelfth-century French Provençal poet, was born in Ribérac, Périgueux. A member of the court of King Richard I of England, he was called "the great master of love" by Petrarch. Though often obscure, his poems are technical masterpieces. He was the inventor of the sestina verse form used by Dante and Petrarch.

DANIEL, PETER VIVIAN, 1784–1860, U.S. jurist, was born in Stafford County, Va. He was associate justice of the U.S. Supreme Court, 1841–60.

DANIEL, SAMUEL, 1562–1619, English poet, was born near Taunton, Somersetshire. He was tutor to William Herbert, who became earl of Pembroke, and to the Countess of Cumberland. He later won favor at court. Daniel's sonnets to *Delia*, published in 1592, was among the first series of Elizabethan sonnets. In the same year he published *The Complaint of Rosamond*, a narrative poem. After *Cleopatra* (1594), a Senecan tragedy, Daniel championed poetry as essential to the education of a courtier or a soldier in *Musophilus* (1599), a dialogue in defense of learning. As master of Queen Anne's revels, he composed a series of court masques and pastoral tragicomedies. Daniel also is known for his prose, *Books of Civil Wars Between York and Lancaster* (1595); *Defence of Rime* (1602), an answer to Thomas Campion's charge that rhyme was unsuited to the English language; and *History of England* (1612–17).

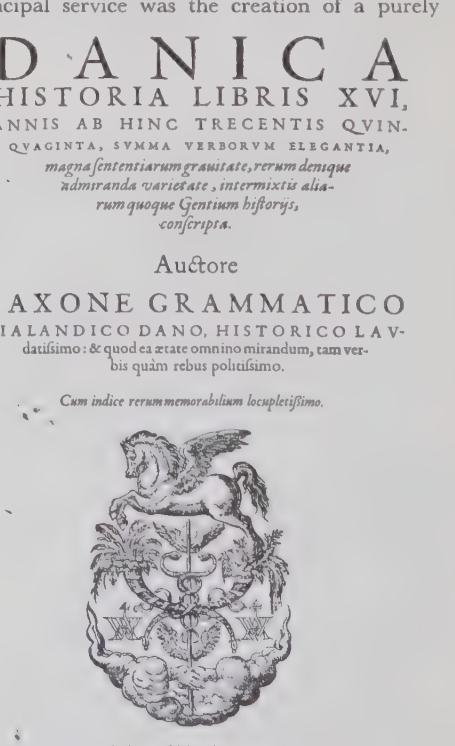
DANIELL, JOHN FREDERIC, 1790–1845, English chemist and physicist, was born in London. He invented a dew point hygrometer, 1820, and the Daniell cell. His works include *Meteorological Essays* (1823) and *Introduction to the Study of Chemical Philosophy* (1830). See BATTERY, (in electricity), Primary Batteries; HYGROMETER.

DANIELS, JOSEPHUS, 1862–1948, U.S. journalist and political leader, was born in Washington, N.C. In 1894 he consolidated the *Raleigh State Chronicle* and the *North Carolinian* to form the *Raleigh News and Observer*, of which he was editor until 1933. Daniels was secretary of the navy, 1913–21, and ambassador to Mexico, 1933–42. He wrote *The Navy and the Nation* (1919), *Our Navy at War* (1922), *Tar Heel Editor* (1939), and *The Wilson Era* (1944–45).

DANIELSON, borough, NE Connecticut, in Windham County, on the Quinebaug River; on the New York, New Haven, and Hartford Railroad and U.S. Highway 6; 8 miles S of Putnam. Danielson is an industrial center which manufactures textiles, machinery, rubber products, and cutlery. Pop. (1950) 4554.

DANISH LANGUAGE AND LITERATURE. The oldest unquestionably Danish records are runic inscriptions dating from about 300. The Danish language represents a form of ancient Norse which originally was spoken throughout the Scandinavian north. Within itself it embraces three dialects—that of Skåne (Scania), of Sjaelland (Zealand), and of Jutland. Of these three it was the second which, after the fourteenth and fifteenth centuries, became gradually consolidated into the literary language of modern Denmark. Meanwhile the language was receiving a strong infiltration of German forms of speech, especially forms of Low German origin such as those used in commerce, shipping, and industry. For some centuries Danish was the speech of the official and educated classes in Norway, but was spoken there with a somewhat harder intonation.

With one notable exception, little deserving the name of a national literature existed in Denmark before the eighteenth century; that exception was a collection of popular ballads known as the *Kaempeviser*, of ancient but somewhat doubtful origin, first put in written form about the middle of the fifteenth century. During the Middle Ages Latin was the literary language of the Danes. The only memorable work written in that language was the *Historia Danica* of Saxo Grammaticus in the twelfth century. In 1479 the University of Copenhagen was founded, and printing was introduced in 1490. Except for the translation of the Bible (1550), Danish literature was content to imitate the platitudes of the Silesian school of German poetry. The hymn writer, Thomas Kingö, 1634–1703, was the one original poet of this period. It was the genius of Ludvig Holberg, 1684–1754 (of Norwegian birth) which first gave Denmark a permanent place in the realm of letters. Holberg was distinguished in history, science, philosophy, and jurisprudence; but his principal service was the creation of a purely



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***Historia Danica*, written by the Danish historian Saxo Grammaticus about 1300, is believed to have provided the basic material for the plot of Shakespeare's *Hamlet*.**

national drama and he came to be called the Father of Danish Literature. The second half of the eighteenth century—the so-called period of enlightenment—was distinguished by utopian reforming tendencies and a mischievous Germanizing influence which cramped and stifled whatever national genius there might have been. There was literary activity, however, among the many literary societies and clubs, and critical reviews such as Knud Rahbek's *Minerva* and *Den Danski Tilskuer*. Rahbek, 1760–1830, was a fine critic, and his house became a favorite rendezvous for the literati. It was then, too, that Peter Suhm, following in the footsteps of Langebek (the founder of the Royal Danish Historical Society), wrote his voluminous though uncritical *Historie af Danmark*. The best poet of this period was Johannes Ewald, 1743–81, who produced a few lyrics of exquisite beauty, while the Norwegian J. H. Wessels, 1742–85, enriched the national literature with the witty parody *Kjerlighed uden Strömper* (Love Without Stockings), in which the bombastic French-style tragic dramas of the day were delightfully satirized.

Romantic Movement. It was the romantic movement which really transformed Danish literature, beginning with the epoch-making lectures of the young Norwegian Henrik Steffens, 1773–1845, at Copenhagen, who had brought back from Germany the spirit of romanticism and a great admiration for Schelling's philosophy. Conspicuous among Steffens' disciples was Adam Oehlénschläger, 1779–1850, Denmark's greatest romantic poet, whose *Aladdin* marked the beginning of a new literary era. Others of this school were Nikolai Grundtvig, 1783–1872, of a deeply religious nature, who, even more than Oehlenschläger, romanticized the old Norse mythology (but most of whose energy was directed to attacking rationalism and all its works); P. M. Möller, 1794–1838, the chief defender of the school against the sarcasms of Jens Baggesen; J. C. Hauch, 1790–1872, originator of the Danish psychological novel, and a poet of high rank; and B. S. Ingeman, 1789–1862, the chief novelist of the school, whose historical romances owe much to Sir Walter Scott.

The influence of romanticism began to wane during the second quarter of the nineteenth century. J. L. Heiberg, 1791–1860, the most prominent figure in Danish literature in this period, was a critic by nature, a playwright by choice, a poet by cultivation, a disciple of Hegel, and an admirer and imitator of the classical Spanish drama. While attacking the extravagances of Oehlenschläger, he (in his famous vaudevilles) invented a curious blend of piquant satire and picturesque idealism.

Modern Danish Literature begins with Steen S. Blicher, 1782–1848, who wrote sketches and stories, chiefly in the Jutland dialect. Fru Gyllembourg-Ehrensvärd, 1773–1856, Heiberg's mother, may be regarded as the inventor of the realistic story in Danish. A kindred spirit to Heiberg is the graceful and caustic satirist and dramatist Henrik Herz, 1798–1870. As erotic poems the vivid and glowing writings of Emil Aarestrup, 1800–56, were unsurpassed. Frederick Paludan-Muller's versified satirical romance, *Adam Homo* (1841), is one of the masterpieces of the language.

Unique in genius and in character is the world-renowned Hans Christian Andersen, 1805–78, the writer of fairy tales, while in the eccentric and poetical Sören Kierkegaard, 1813–55, a master of dialectics, Denmark possessed one of the greatest of modern philosophers whose influence only began to be felt elsewhere in Europe in the twentieth century with the advent of existentialism.

After 1870 the Danes wrote increasingly of life's actualities. This realistic movement was given impetus by Georg Brandes, 1842–1927, whose critical writings influenced many distinguished Danish authors, especially the decadent and pessimistic Herman Bang, 1857–1912. The ironical Henrik Pontoppidan in 1917 shared a Nobel prize with another Dane, Karl Gjellerup. Johannes V. Jensen, author of *Den Lange Rejse* (The Long Journey, 1929), who also distinguished himself in the field of history and archaeology, was awarded the Nobel prize for literature in 1944.

Other notable twentieth century writers were the satirical poet Helge Rode; Karin Michaelis, whose novels have been widely translated; Sven Lange, critic and dramatist; and Martin Andersen-Nexö, 1869–1955, best known for his proletarian novels.

DANISH WEST INDIES. See VIRGIN ISLANDS.

DANITE, member of a secret society reportedly formed among the Mormons in Missouri about 1838. Members were bound by oath to obedience and to reprisals on Gentiles. Mormon authorities always repudiated any such society and denied any connection with it. Opponents of the Mormons held Danite bands responsible for numerous atrocities such as the Mountain Meadows Massacre. See MORMONS; MOUNTAIN MEADOWS MASSACRE.

DANNAT, WILLIAM T., 1853–1929, U.S. painter, was born in New York City. He studied in Paris under Mihály von Munkácsy, who strongly influenced Dannat's early work such as *The Quartette* (1884), but whose bold style shows Dannat's lack of conventionality. Later Dannat came under the influence of Japanese art. His *Sacristy in Aragon* and *Café Chantant* (1892) showed masterly handling of artificial light. His other works include *Lady in Red*, *Lady in White*, and *Aragonese Smuggler*.

DANNECKER, JOHANN HEINRICH VON, 1758–1841, German sculptor, was born in Stuttgart, and after 1790 taught sculpture there. His sensitive and idealistic talents developed along two lines—the pagan and the Christian—as the titles of his principal works show: *Sappho*, *Psyche*, *Ariadne on the Panther*, *Christ*, and *John the Baptist*. One of the better sculptors of the classical school, he executed busts of Schiller, Gluck, and Lavater.

DANNEMORA, village, NE New York, in Clinton County; on the Delaware and Hudson Railroad; 35 miles NE of Saranac Lake, N.Y. Dannemora, located in the northern section of the Adirondack Mountains, was an iron mining center in the mid-nineteenth century. It was incorporated in 1881, a year after the mines were abandoned. Clinton State Prison is nearby. Pop. (1950) 4122.

DANNEMORA, town, SE Sweden; 70 miles N of Stockholm. Dannemora is the center of a rich iron mining area that has been worked since the fifteenth century. Zinc and silver are also mined here. Pop. 680.

D'ANNUNZIO, GABRIELE, 1863–1938, Italian writer and political figure, was born in Pescara, the descendant of a noble family. He was but 17 when his first volumes of poetry appeared. These were notable for their flamboyant paganism (much influenced by Giosuè Carducci) and also because they coincided with his first notorious love affairs. Soon afterward he formed the famous liaison with the actress Eleonora Duse, and celebrated his feelings in the novel *Il Fuoco* (1900). Meanwhile his personal life had become so profligate that he was forced to flee to France in order to escape his creditors; while there he wrote *Le martyre de Saint Sebastien* (1911). Because of his daring exploits as an aviator in World War I, he returned home a national hero.

He found the role of conquering Caesar much to his liking, and in 1919, during the dispute between Italy and Yugoslavia over Fiume, gathered together a small personal army and seized the town, holding it for more than a year in defiance of both the League of Nations and the Italian government. This act laid the groundwork for Mussolini's equally dramatic March on Rome, with its comic-opera trappings. An ardent supporter of Il Duce, who found Gabriele's writings well suited as mental food for the Fascist intelligentsia, D'Annunzio was rewarded in 1924 with the title Prince of Monte Nevoso. The "prince," having retired to his palace on Lake Garda, pro-

ceeded to live out his days in his established pattern of hedonism and eccentricity. Probably most remarkable about D'Annunzio was the fact that his writing, in all its bombastic obviousness and cheapness of sentiment, was taken so seriously by his contemporaries. He was a masterly phrase maker, and knew well how to exploit the beauty of the Italian language, but here his value as an artist ceased.

DAN RIVER. See Roanoke River.

DANSVILLE, village, SW New York, in Livingston County; on the Delaware, Lackawanna, and Western, and the Dansville and Mount Morris railroads; 40 miles S of Rochester. Periodicals, steam power equipment, nursery stock, and shoes are produced in Dansville. The village was settled in 1795 and incorporated in 1845. Clara Barton founded the first chapter of the American Red Cross here in 1881. Pop. (1950) 5253.

DANTE ALIGHIERI, 1265–1321, was born in Florence, Italy. He is best known as author of the *Divine Comedy* (see Divine Comedy). He was called the greatest singer of the Christian truth by Pope Benedict XV in 1921. Often called the father of the Italian language, he was in a very real sense the creator of the common literature of Western man.

Background

Guelphs and Ghibellines. Dante began as a Guelph of the upper ranks (see Guelph and Ghibelline). In 1250 the Ghibelline emperor Frederick II died (he was the last emperor whom Dante recognized as the legitimate ruler over the whole of Italy). As the restoration of the empire was combated by the papacy, no less than 177 sovereign cities and princes sprouted between the Alps and Naples. Florence, a banking center, annexed from the Ghibelline nobles the villages of the surrounding country. Dante's family held real estate inside the walls: on the one hand they looked down on the new citizens from the countryside; on the other they dreaded the powerful families who had held office from the emperor. Until 1289 the Guelphs showed solidarity, with the popes their natural protectors. In that year the Guelphs of Florence, with Dante in the cavalry, vanquished the Ghibellines of Tuscany in the battle of Campaldino, but immediately fell out among themselves. Magnates, Popolo Grasso (the five richest guilds), and Popolani split. The latter demanded that all citizens must belong to a guild: Dante chose that of physicians and apothecaries. Later the relation to the papacy produced a second rift within the Guelphic party and it split into Neri (black) and Bianchi (white); the Neri were willing to help the world-wide papal plans for an alliance with France, while Dante's party, the Bianchi, tried to manage independently.

In 1301 Pope Boniface VIII and the Neri triumphed; by 1303 the pope himself was overpowered and his successor was removed to France (the start of the Avignon captivity). The popes had overreached themselves: for if there was no emperor, there also was now no pope in Rome. In vain did Henry VII of Luxembourg receive the imperial crown in 1312. He threatened to invade Florence but died near Siena, south of Florence, in 1313.

Dominicans and Franciscans. In this chaos, with tens of thousands of exiles and refugees milling through Italy, Italians were comforted by the almost 100,000 followers of St. Francis and St. Dominic. Francis of Assisi appeared to many as the sublime imitator of Christ; indeed the pope issued a bull forbidding too close an identification of St. Francis with Christ. Dominic was seen as the Lord's dog (*Domini canis*), for St. Dominic's mother had dreamed that she had borne the Lord's dog. Both orders had an extraordinary effect through their schools, at which Dante studied in Florence and probably in Bologna. Among the hosts of teaching friars the Dominican Thomas Aquinas and the Franciscan Bonaventura held no monopoly; they were the first among equals, a fact that has puzzled many a modern who finds Dante not at all surrendering to Thomism, which did not exist in Dante's day. Without the work of these orders Dante might have produced a Latin poem as had the Florentine Arrigo, who in 1193 wrote an elegy on man's fate in the manner of Ovid. But the friars had prepared the way for a new blend of paganism and theology. The Roman Aeneas who descended into the netherworld, and the Apostle Paul who ascended to the third heaven were blended by Dante. Francis was the imitator of Christ, Dominic was the Lord's dog, and Dante took inspiration from each of these two saints of his century. Moreover, the *Divine Comedy* contains prophecy and cipher which acknowledge their influence and which foretell Dante's own role in God's plan; three times the reader is told of it, I: 1, 108; II: 33, 43; III: 15–16. (Citations I, II, III are to the *Inferno*, *Purgatorio*, and *Paradiso*, respectively.) In the first, Dante is the greyhound (an allusion to Dominic) born in the sign of Gemini (twins) to redeem the world. In the second, he is D X V (500, 10, and 5 translated into Roman numerals). In Dante's day, *X* always meant Christ (an allusion to Francis); and the reader has already been prepared for *V* (for *Veltro*, greyhound in Italian). D X V reads, then, "Dante, Christ's Greyhound." And, lest there be misunderstanding, the poet adds, "messo di Dio," the literal translation of Paul's title of apostle. Finally, in part III (Paradise), Dante's ancestor reaffirms that the guest of Scaliger (to whom the manuscript of Part III was sent) would save the world. Clearly, Dante did not conceive of the *Commedia* as a mere poem to be read as entertainment; but as an act of faith intended to change the world.

Outer Life

It seems Dante lost his mother at birth and his father in 1283, while the poet was still a young man; he nowhere mentions them. At the age of 12, after the custom, Dante was betrothed to Gemma Donati, a young girl of prominent family; the marriage seems to have been consummated after 1291. During Dante's exile, Gemma saved the family property. They had sons and daughters. When a daughter chose her name as a nun, she chose "Beatrice," we may think, in her father's honor. For Beatrice was Dante's name for the woman whom he decided to praise as nobody ever before had spoken of a woman. She was Bice Portinari, 1266–1290. He was aware of meeting her at the age of nine; at 18, because she showed some friendliness, he burst out in "the sweet new style." After her death, Dante turned to a course of studies lasting at least 30 months, during which his stupendous knowledge must have received its foundation.

After 1295, becoming more active politically, Dante was constantly in one or the other city office or diplomatic mission. The Bianchi made him one of the six Priori for the two summer months of 1301: it was his highest and his most disastrous political office. His best friend, Guido Cavalcante, was banished; Dante voted against military help to the pope; excommunication threatened. In the fall, Dante went to the papal court as an ambassador, and there learned that the Neri had taken over in Florence. Clearly, as a Bianchi he was no longer at home, and he could not be a Neri: from now on, only the Ghibellines could protect Dante and he, proudly calling himself a party of one, furnished the Ghibellines with a new political program.

Dante never set foot in Florence again. On Jan. 27, 1302, he was condemned unheard, and on March 10 was threatened with burning if he should return. It is true that by 1315, under certain conditions, he might have made use of an amnesty, but the conditions implied his guilt. In this period Dante wrote the letter (the ninth of 10 that have been preserved) which is so great that Mazzini recommended its study to the political refugees of 500 years later. In 1315 Dante and his sons were by name banned once more.

DANTE

Dante was a member of the Guelph cavalry in his youth, fighting the Ghibelline party.

Dante's writing was acute and learned, for he studied with the Dominicans in Florence.

The pinnacle of Dante's official career was ambassadorship to the papal court in Rome.

Dante's banishment from Florence in 1301 was a heart-breaking moment in a dramatic life.

Dante has been rightly called the father of Italian literature, for he was the first major writer to use the Italian vernacular. His talent was evident early in life and he wrote some fine works while still a youth; his *Vita Nuova* alone would have guaranteed him lasting fame. Dante lived in a period of turmoil, both political and religious. His *Divine Comedy* is full of allusions to this fact, but throughout he reflected temporal issues in terms of timeless Christian values. He is one of the greatest Christian poets.

ART INST. OF CHICAGO

Barque of Dante by Delacroix

In 1310 Dante had hurried to pay his homage to the short-lived emperor Henry VII; but in the main, he depended for protection on the Malaspina family in the Lunigiana; the Scaligeri of Verona; Uguccione in Pisa; and perhaps for the longest number of years on the family of Guido Novello da Polenta in Ravenna. Here he died of a fever on Sept. 13 or 14, 1321, and in Ravenna is his grave. To his hosts, eulogized in his verse, went the *Commedia* as it grew. In baptism, Dante had been named Durante; yet he preferred to die as Dante, the Giving One. He had given to Bice her lasting fame as Beatrice—that is, the "beatifying one." And he had given to the then vulgar name of comedy the new meaning which after 1500 the printers expressed by the adjective "divine."

Creative Life

Dante began as a songful minstrel: "Did you write the canzones in the new style?" he is asked in Purgatory (II: 24, 49), and he gently replies: "I am to me one who when love inspires me, gives heed and the melody which speaks inside, I disclose it to you."

From 1294 to 1302 he was absorbed by *le presente cosi*, the affairs of the day (II, 31, 34). Later he occasionally wrote a song (fourth letter) or went on political errands for one of his patrons as the persuasive orator he was. In the main, Dante became more and more the first creative Christian artist—that is, the combination of Israelitic prophecy and Greek art which later came to be expected from the creative man, a man twice-born and, besides, a man renewing the medium in which he works.

Out of the songs of his youth he composed *La Vita Nuova* (date unknown). Others have collected into the *Canzonieri* his 67 other sonnets and canzone, of which the first is addressed to Guido Cavalcante. After 1302 Dante seems to have written the three books by which he prepared himself for the main task: the *De monarchia* (On Government) in three parts; the *Convivio* (Symposium) planned in 15 treatises (four of which were completed), written in Italian for lay men and women; and the *De vulgari eloquentia*, two books completed out of four projected. He also wrote some Latin verses (*Eclogae*) to an admirer in 1319 defending his writing in Italian; and his one and only scientific essay, *Quaestio de aqua et terra*, an academic disputation on the earth being created later than the water. The *Vita Nuova* (New Life) places side by side Dante's songs for Beatrice, a dramatic prose story of biblical coloring in which he quotes Jeremiah, the psalms, the gospel to adorn his own rebirth into a new life by his love, and a cut-and-dried analysis of the structure of each poem. The *De monarchia* revives the political order of centuries back. Free men must become united in a world government despite local autonomy (Book I). The Roman Empire has been necessary for the coming of Christ and must be enlarged from ocean to ocean (II). Government is directly from God; the Church cannot overrule it (III). *Convivio* popularizes the philosophical doctrines on the virtue of Aristotle the Master and "Duke of Reason" (quoted 76 times). *De vulgari eloquentia*, written in Latin for the experts, surveys the dialects of Italy from Tirol to Sicily, and for the first time conceiving them as one language, proposes a nobler (*illustre*) idiom for writers in Italian.

Since Dante, the ideas of a Roman Empire or of a world emperor have been given up. Every nation's right to its own literature is accepted. But man's relation to the past as well as to future of the whole race, and to the present life of any nation within humanity, is in large measure inherited from Dante: for Dante was open to the whole of pre-Christian nature, to astronomy and philosophy, history of nations and art, geography, and so on. Indeed his generous treatment of Mohammed and of Islam has given rise to an as yet unsettled controversy. One scholar, Asin Palacio, thinks that Dante imitated an Arabic model in writing his *Comedy*. In any case, mankind after Dante was heir to his catholicity. For the future, Dante warned that non-Christians—he mentions the Hindus—might win out before God unless Christians make better use of their privilege. For the nations, Dante created a faith that united Italy through 500 years of chaos and servitude. Without Dante's three contributions, man might still live in a provincial universe.

Man may improve on Dante's world, but amplify its immensity he cannot. In the very year in which Boniface VIII claimed to be both emperor and pope, Dante the exile turned and asked: "What is left to me?" And he replied: "Let Love be warm and let hope be alive. Then, even though heaven's kingdom may seem violated, Aye, Divine Will may seem overcome . . . that is only the way a man triumphs of man. Ov'r God they win as He wills to be won who, conquer'd, from within by bounty conquers" (III: 20, 95ff). Because Dante recognized the Christian quality of victory in defeat as the divine spark in all men and in himself, the *Divine Comedy* became the justification of Dante's own divinity: for a faith that did not mold the believer's own works, would not be faith.

Therefore, Dante is a different man in different hands. Exactly to the degree that the reader's own experience extends does he ascribe to Dante an artistic or poetical license, a trick, a device; or recognizes in Dante's journey the chaste gown thrown around 20 years of suffering: decent folk do not parade their wounds before the world without a garment of *vergogna* (reverend shame) such as Dante requires of the creative man in the *Convivio*. Dante says that he undertook the journey (of the *Commedia*) from April 4 to 7, 1300, as our representative, since every man is in hell or purgatory or paradise. For this feat he is called the central man of all the world by John Ruskin. "The man behind the verse is far greater than the verse itself. . . . A man who reads the last three cantos of the *Commedia* cannot do a mean thing for several weeks afterwards," added James Russell Lowell.

What, then, were the phases of Dante's development? In his youth, he exploited the biblical language to adorn his personal love. But the "Divine Comedian" reversed his course. Now it was Dante who contributed the tender language of a lover to the drama of God and men's souls. When Dante would have been 70, in 1335, Giotto who knew him well (and whom Dante praises, II: 11, 96), painted him with the Saints in the Palazzo del Podestà in Florence. By 1373 Florence was ready to ask Boccaccio for the first *Lettura Dantis*, still given annually in many Italian cities. With Greek and Latin abandoned by American schools, Dante has been proposed in their place. For all must now agree with Boccaccio that Dante "is a river in which a tiny lamb wades and a large elephant has ample depth to swim."

Eugen Rosenstock-Huessy

DANTON, GEORGES JACQUES, 1759–94, French revolutionist and political leader, was born in Arcis-sur-Aube. He studied law and in 1790 went to Paris where he joined (and soon became a leader of) the radical Cordeliers Club. He was one of the organizers of the attack on the Tuileries, 1792, which resulted in the downfall of the French monarchy, and became one of the revolutionary triumvirate which also included Marat and Robespierre. When the Prussians invaded France in an attempt to restore the monarchy, Danton's stirring oratory was a major factor in the heroic resistance of the hastily recruited, ill-trained army which successfully turned back the invaders. Danton's personal popularity—he was called the saviour of France—brought upon him the enmity of other revolutionary leaders, particularly Robespierre. When Danton asked for moderation in the reign of terror in 1794, he was accused of having royalist sympathies and was denounced before the Committee of Public Safety by Saint-Just. Danton undertook his own defense and his eloquent oratory almost inspired a popular revolt; Saint-Just considered this another example of Danton's counter-revolutionary tactics and demanded summary conviction for the defiant orator. The convention acquiesced; Danton was condemned and a few days later was guillotined. See FRANCE, History; ROBESPIERRE.

DANUBE RIVER, ancient Danubius or Ister (lower reaches only), German Donau, Czech Dunaj, Hungarian Duna, Serbo-Croatian and Bulgarian Dunav, Rumanian Dunărea, and Russian Dunai, the second longest river of Europe, rises in SW Germany and flows generally W to E to the Black Sea. Three European capital cities, Vienna, Budapest, and Belgrade, are located on the banks of the river.

Description. The Danube has a total length of about 1750 miles and drains a basin covering more than 300,000 square miles. The Danube is formed at an elevation above 2000 feet by the union of the Brege and Brigach rivers in southwestern Germany, in the Black Forest of Baden-Württemberg, about 60 miles southwest of Stuttgart. The upper section of the river loses some of its volume through underground flow to the Aach and Rhine rivers. At one point the Rhine is only about 20 miles distant from the Danube. In its German reaches the Danube flows northeast and then

The Danube River at Budapest reflects the illumination of the Fisher Bastion, a remnant of the city wall on the west bank in Buda, the older half of the Hungarian city.
BLACK STAR

Location Map of the Danube River

southeast, receiving as tributaries the Iller, Lech, Altmühl, Naab, Regen, and Isar rivers. Below Ulm the Danube is navigable for small vessels; after Regensburg larger ships can navigate the river.

The Danube enters Austria at Passau, where it receives the Inn, and flows generally eastward across northern Austria, past Linz and Vienna. Major tributaries in Austria are the Traun and Enns. The German and Austrian sections of the Danube are noted for their scenic beauty and are rich in historical and literary association. Below Vienna the Danube forms a portion of the Austrian-Czechoslovak border, receiving the Morava (March) River from the north and flowing roughly southeast through a corner of Czechoslovakia. About 10 miles below Bratislava the Danube forms part of the Czechoslovak-Hungarian border. Here the river trends to the southeast and east, receiving the Leitha, Raab, Váh, Hron, and Ipel rivers. Near Vác the Danube turns south from its easterly course and flows in a meandering channel through central Hungary, past Budapest and Mohács. Below Mohács the Danube enters northeastern Yugoslavia and follows a winding course to the southeast, by Novi Sad and Belgrade. In Yugoslavia the Danube receives several of its largest tributaries, including the Drava, Tisza, Sava, Timis, and Morava rivers.

Almost 20 miles below its union with the Yugoslavian Morava, the Danube forms part of the border between Yugoslavia and Rumania. This stretch of the river passes through the western Transylvanian Alps in narrow gorges, among them the famous Iron Gate. The gorges end below Turnu-Severin and the river flows slowly to the east across the Walachian Plain, forming most of the Rumanian-Bulgarian border. Major tributaries in this section are the Jiu, Iskar, and Olt rivers. East of Silistra the Danube turns north across eastern Rumania and splits into numerous meandering channels surrounded by extensive marshes. The Ialomiţa River is the major tributary. Near Brăila the many channels of the Danube unite, receiving the Siretul and Prut as tributaries, and flow past Galaţi. Below Galaţi the Danube has a generally easterly course and forms part of the border between Rumania and the U.S.S.R. Near Tulcea the Danube again splits into numerous channels that flow to the Black Sea in a large delta. The main delta distributaries of the Danube, from north to south, are the Kiliya, the Sulina, and the Saint George. They divide the delta into three major islands—Letea, Saint George, and Dranov.

The lower sections of the Danube River are flanked by extensive marshlands and are prone to periodic flooding. Great quantities of silt are carried down the stream and relatively rapid siltation is occurring in the delta region. Large rafts of floating vegetation are carried along the lower reaches of the river, and the surrounding area is frequented by many water birds.

The Danube River is one of the major trade arteries of the continent and has played a prominent role in the history of central and eastern Europe. Commercial development of the river has been hindered, however, by the political disunity of the riparian nations. The river is well suited to navigation with a year-round volume of flow that makes shipping possible at all seasons. Furthermore, the Danube

passes through several important industrial and mineral producing areas, besides traversing one of the major grain growing regions of Europe. Navigation difficulties in the Iron Gate section are overcome by a canal, and impediments in the tortuous delta reaches are circumvented by the Danube-Black Sea Canal leading from Cernavodă to near Constanţa. The Danube is linked with the Rhine River system through the Ludwig Canal and the Main River. The Danube-Oder Canal joins the Danube with the Oder through the Morava River and the Moravian Gate. The Tisza and Danube rivers are linked by canals in Hungary and Yugoslavia.

History. At the time of the Roman Empire the Danube River formed the frontier against the barbarians to the north. After the decay of Roman civilization the Danube Valley formed a convenient route through which successive waves of invaders entered Europe from the east, including the Huns, Avars, Bulgars, Magyars, Mongols, and Turks. Danube navigation was declared free to all nations by the Treaty of Paris in 1856. The agreement provided for a European Commission to be responsible for improving river navigation in the delta section. After the Treaty of Versailles (1919) an International Danubian Navigation Commission was formed in 1921 with headquarters at Vienna. The commission was to maintain the liberty of navigation from Ulm, Germany, to Brăila, Rumania, for ships under all flags. The European Commission retained its base at Galaţi and continued to be responsible for the delta reaches. In 1938 the Rumanians achieved what was virtually national control over the lower reaches. Germany, having previously repudiated international control of the Danube in 1936, forced the dissolution of the international commission in 1940. During World War II a German navigation company took full control of the river. The peace treaty of 1947 between the Allies and Rumania stipulated that Danube navigation be free to all nations; however, a conference held at Belgrade in 1948 adopted a Soviet proposal for exclusive eastern European control of the river. The western nations unsuccessfully opposed this plan as unfair and contrary to previous international decisions. Agreements concluded in 1955 between the Austrian and Soviet and Soviet satellite governments recognized the right of Austrian shipping to use the entire stretch of the river to the Black Sea.

DANUBIAN PRINCIPALITIES, the former territories of Moldavia and Walachia under the Ottoman Empire, especially in the late eighteenth and nineteenth centuries before their union to form Rumania. See Rumania, History.

DANVERS, town, NE Massachusetts, in Essex County, on a tidal inlet of Massachusetts Bay, on the Boston and Maine Railroad; 15 miles NNE of Boston. The principal manufactures in Danvers are leather, shoes, chemicals, paper boxes, crayons, and electronic equipment. The town, settled in 1636 by people from Salem, was called Salem Village. It is memorable as the place where the witchcraft hysteria first appeared. About 1752 the settlement was renamed and incorporated. The shoe industry was established in 1787 and nails and carpets were manufactured here before 1850. Among the historic points of interest are Oak Knoll, the home of John Greenleaf Whittier; the birthplace of Israel Putnam; the home of Rebecca Nurse, victim of a Salem witchcraft hunt; the Judge Samuel Holton House (1670); the Page House (1754); and the Samuel Fowler House. It is the site of the Danvers State Hospital for the Insane and the Essex County Agricultural School. Pop. (1950) 15,720.

DANVILLE, city, E central Illinois, county seat of Vermilion County, on the Vermilion River; on the Chicago and Eastern Illinois, the New York Central, and the Wabash railroads; and U.S. highways 150 and 136; 5 miles W of the Indiana state line and 118 miles S of Chicago. Situated in an agricultural area that produces corn, wheat, oats, and livestock, Danville is a market center. The city was formerly an important coal mining center. Chief manufactures include paper boxes, bricks, hardware, furnaces, industrial clothing, automotive parts, electrical components, and industrial trucks; there are also foundry and food processing industries. Nearby is Kickapoo State Park. In 1824 Dan Beckwith, for whom the city was named, built his trading post on the site of a Piankeshaw Indian village. Danville's First National Bank occupies the site of a building in which Ward Hill Lamon and Abraham Lincoln had a law office from 1852 to 1859. Pop. (1950) 37,864.

DANVILLE, city, central Kentucky, county seat of Boyle County; on the Southern Railroad and U.S. Highway 150; 32 miles SSW of Lexington on the S edge of the bluegrass region. Danville is a railway division point, has a tobacco warehouse, and manufactures furniture, men's clothing, shoes, glass tubing, fertilizer, and gas-fired industrial equipment. The area was settled in 1775 and the Kentucky constitutional convention had several sessions here, 1784–1792. Danville is the seat of Centre College, founded in 1819, the Kentucky School for the Deaf, founded in 1823, and a state mental hospital. The settlement was incorporated as a city in 1836. Pop. (1950) 8686.

DANVILLE, borough, E central Pennsylvania, county seat of Montour County; on the Susquehanna River; the Pennsylvania, the Reading, and the Delaware, Lackawanna, and Western railroads, and U.S. Highway 11; 50 miles NNE of Harrisburg. The area was laid out in 1790 and the discovery of iron ore, coal, and limestone in nearby Montour Ridge accelerated the town's development. It was here that the first iron T-rail for railroads was manufactured in 1845. Iron, steel, and textile products are manufactured in Danville. A state hospital for the insane is located here. Pop. (1950) 6994.

DANVILLE, city, S central Virginia, in Pittsylvania County but independent of it; in the Piedmont; on the Dan River; on the Atlantic and Danville and the Southern railroads and on U.S. highways 29, 58, and 360; 3 miles from the North Carolina state line, 55 miles SE of Roanoke. Situated in a tobacco area, Danville is one of the nation's largest bright-leaf tobacco market centers. The city has cotton mills, clothing, and other textile manufacturing, and furniture, lumber products, fertilizer, foundry, meat packing, beverages, and brick tile industries. Danville was the last capital of the Confederacy. The former home of Jefferson Davis is now a public library, the former meeting place of his cabinet a Confederate memorial and museum. Pop. (1951 special census) 44,658.

DANZIG, or Gdańsk, a Baltic seaport, N Poland, capital of the province of Gdańsk, lying near the mouth of the Vistula River, 174 miles NNW of Warsaw. Danzig emerged from about 93 per cent destruction in World War II to regain its importance as a Polish port and major shipbuilding center. In 1939 the city's population was 265,000 and about 89 per cent German; in 1954 it was about 231,000 and almost wholly Polish.

Before World War II Danzig was famed for its well preserved medieval streets and old architectural landmarks. Most noted of these was the Church of St. Mary (1340–1502), one of the largest Protestant churches in Europe and a fine example of the Vistula (red brick) Gothic style. It was destroyed by bombardment in 1945. The lovely fourteenth century Town Hall has been rebuilt, as have the elaborately designed burghers' houses on Long Street and the High and Green gates of the Long Market.

History. Danzig first appeared in history in 997 and early became the capital of the Polish province of Pomorze (Pomerelia). Its growth was stimulated by an influx of German tradesmen and settlers. The city came under the rule of the Teutonic Knights in 1309; it joined the Hanseatic League in 1358 (see Hanseatic League) and soon became one of the most

EUROPEAN

The medieval architecture of Danzig has long been a distinctive feature of the historic Baltic port. Many of the buildings destroyed in World War II have been restored.

important medieval commercial centers. In 1454 Danzig drove out the Teutonic knights (see TEUTONIC KNIGHTS) and placed itself under the protection of the kings of Poland as a free city, retaining extensive rights of self-government. Developing rapidly in power and wealth during the Reformation, Danzig reached the height of its prosperity toward the end of the sixteenth century. Chief exports in that period were grain and wood from the Polish hinterland. Unsettled conditions caused by attacks on Poland by neighboring powers in the seventeenth century caused the city's decline. Danzigers loyally resisted the invasion of Poland by Charles X of Sweden in 1655 and offered a heroic defense in 1734 when king Stanislas I took refuge in the city during the War of the Polish Succession. In 1793, at the second partition of Poland, Danzig was annexed to Prussia and remained a part of it as the capital of West Prussia until 1919, except for the brief period from 1807 to 1814 when, under a Napoleonic edict, it became a free city.

In 1920 under the Versailles Treaty, a Free State of Danzig, embracing 754 square miles of the city and surrounding area, was constituted and placed under supervision of the League of Nations. In the years between the two world wars Danzig again prospered as a port of Poland. Nevertheless it became a center of German nationalist extremism dedicated to the reannexation of Pomorze, the so-called Polish Corridor, to Germany. In retaliation the Poles transformed the neighboring fishing village of Gdynia into one of the largest ports of Europe. In 1933 the Nazis gained a majority in the *volkstag*, the parliament of the Free State of Danzig. On Oct. 24, 1938, four weeks after the Munich agreement, Hitler secretly demanded Danzig from Poland; he repeated his request openly in March 1939. The Poles refused and the Nazis smuggled arms and troops into the area, whereupon the Poles increased the number of their customs inspectors; this step provided Hitler with a pretext for invading Poland on Sept. 1, 1939. See GDYNIA.

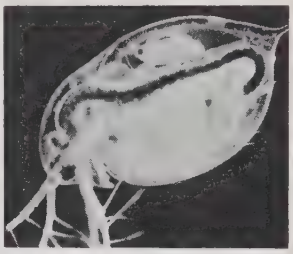
The Russians entered the territory of the former Free State of Danzig on Mar. 7, 1945, and laid a 70-mile siege around the port and city. After two weeks of heavy shelling the Germans surrendered and the Polish flag was hoisted over the city. Danzig was declared "an inseparable part of the Polish Republic" on Mar. 31, 1945. This transfer of Danzig to Poland was recognized on Aug. 2, 1945, by the Potsdam Declaration of the United States, Great Britain, and the U.S.S.R. See POLAND.

DAPHNE, in Greek mythology, a nymph, daughter of the river god Reneus. When Apollo fell in love with her and pursued her, she was changed by her mother, Earth, into a laurel, which thereafter was Apollo's favorite plant.

DAPHNE, a beautiful park or garden about 5 miles S of Antioch which contained a famous temple and grove of Apollo. It was a favorite place of residence of the Seleucid kings, of Pompey, and of the Roman emperor Commodus.

DAPHNE, a genus of about 50 species of hardy evergreen and deciduous shrubs belonging to the mezereum family, *Thymelaeaceae*. Native to Europe and Asia, the genus has been introduced to eastern United States. Daphne shrubs have mostly alternate leaves and fragrant purple, white, or green flowers that develop into drupelike fruits. Daphne thrive best in well-drained light soil and propagation is by seeds and layers. *D. mezereum*, a common species in the United States, blooms early in the spring. Its lilac-colored, fragrant flowers appear on the bare branches before the leaf buds have opened. Its fruit is scarlet.

DAPHNIA, or water flea, a very small fresh-water crustacean (see CRUSTACEA, *Classification*). About 2 millimeters long, the water flea has a compact body often encased in a bivalved shell. It swims by rapidly jerking its pair of large branched antennae. One of the most primitive crustaceans, the water flea, common in ponds and streams, is important as food for young fish and other small aquatic animals.



P. S. TICE

Daphnia or Water Flea

DAPHNIS AND CHLOË, a Greek prose pastoral romance attributed to Longus, a Greek sophist of the fourth or fifth century. It is the idyllic story of Daphnis, foster son of Lamon, a shepherd, and Chloë, the shepherdess foster daughter of Dryas, and the eventual transformation through the years of their naïve courtship into mature love. The story ends happily when Daphnis and Chloë, reclaimed by their wealthy parents, are married. The story has been translated into many languages and was revived by the French humanist, Jacques Amyot, whose translation, 1559, became a French classic. George Moore's English translation, *The Pastoral Loves of Daphnis and Chloë*, was published in a limited edition in 1924.

DA PONTE, LORENZO, real name Emanuele Conegliano, 1749–1838, Italian poet, was born in Ceneda. He wrote the librettos for Mozart's *Le Nozze di Figaro*, *Don Giovanni*, and *Così fan Tutte*, and was later librettist of the Drury Lane Theater in London. In 1805 he emigrated to the United States.

DAPSANG. See GODWIN-AUSTEN.

D'AQUINO, IVA IKUKO TOGURI, known as Tokyo Rose, 1916?– , U.S. traitor, was born in Los Angeles, Calif., of Japanese parents. During World War II she broadcast Japanese propaganda to U.S. troops in the Pacific theater of war under the names Tokyo Rose and Orphan Annie. Found guilty of treason by a jury in San Francisco, 1949, she was fined $10,000 and sentenced to 10 years' imprisonment at the federal reformatory for women at Alderson, W.Va. She was released in 1956.

DARAGA. See LEGASPI.

DARBHANGA, city, NE India, in the state of Bihar, capital of the district of Darbhanga; 60 miles NE of Patna. The city is a rail and highway junction. Rice, sugar, and jute mills are located here. Darbhanga has a medical college. Pop. (1951) 84,816.

D'ARBLAY, MADAME. See BURNEY, FRANCES.

DARBY, borough, SE Pennsylvania, in Delaware County; on Darby Creek; on the Baltimore and Ohio and the Pennsylvania railroads, and U.S. Highway 13; 5 miles SW of Philadelphia. Chiefly a residential suburb, it manufactures textiles, clothing, and boats. Darby was founded in 1682 and incorporated in 1853. Pop. (1950) 13,154.

DARDANELLES, ancient Hellespont, Turkish Çanakkale Boğazi, narrow strait linking the Aegean

Location Map of the Dardanelles

Sea in the W with the Sea of Marmara in the E, and separating the Gallipoli Peninsula of Turkey in Europe from Asia Minor or Turkey in Asia. The Dardanelles is about 40 miles long from southwest to northeast and varies in width from 1 to 4 miles. Both shores of the strait are high, particularly the northern one, which is generally rugged. The entrance from the Aegean Sea is about 2 miles wide. Navigation in the strait is dangerous because of strong currents. The Dardanelles is of vast strategic and commercial importance, commanding the entrance from the Mediterranean to Istanbul and the Black Sea. Major towns on the strait are Canakkale, Eceabat, and Gallipoli. Strong fortifications have been built along the Dardanelles, notably the forts at Seddülbahir and Kumkale, commanding the Aegean entrance to the strait.

History. Throughout history the Dardanelles has been important in military affairs and international trade. The ancient city of Troy was located on the south shore of the Aegean entrance to the strait. In 480 B.C. Xerxes constructed the famous bridge of boats at the narrow point of the strait, between Abydos and Sestos. Alexander the Great crossed here in 334 B.C. from Europe to Asia. The legendary story of Hero and Leander is associated with this section of the Dardanelles, and it was here that Lord Byron duplicated Leander's feat of swimming the strait.

Since the fifteenth century both sides of the Dardanelles have been under Turkish control. The Dardanelles is easily defended, but in 1807 the British admiral Sir John Thomas Duckworth forced his fleet through the strait. A treaty signed by the major European powers in 1841 agreed to prohibit the peacetime passage through the Dardanelles of all warships other than those of Turkey. These provisions were confirmed in later years but were not always honored.

The Turkish fort at Canakkale, strategically located on the Asian side of a narrows in the Dardanelles, successfully resisted heavy Allied shelling in 1915 during World War I.

TURKISH PRESS ATTACHÉ

World Wars I and II. The Dardanelles campaign during World War I was undertaken by the Allies to open communication between the Mediterranean and Black seas, facilitating the sending of assistance to Russia. The campaign began early in 1915 as a naval operation and was later strongly supported by land forces, mainly British, Australian, New Zealand, and French. Several landings were made, chiefly on the Gallipoli Peninsula, and the Allied forces suffered terrible casualties at the hands of the strongly entrenched Turks. After great losses had been inflicted on the Allied naval and land forces the enterprise was abandoned. The last Allied troops were withdrawn in January 1916. The Treaty of Lausanne, between the Allies and Turkey, was concluded in 1923. It provided for the demilitarization of the Dardanelles and the Bosporus. In 1936 the Montreux Convention gave Turkey the right to remilitarize the straits.

The Turks closed the Dardanelles during World War II. However, in 1944, despite its 1939 alliance with Great Britain, Turkey allowed some German vessels to pass from the Black Sea into the Aegean. After January 1945 Turkey allowed Allied supply ships to pass through the Dardanelles on their way to the U.S.S.R. After World War II the U.S.S.R. urged a revision of the Montreux Convention and requested bases on the Dardanelles and the Bosporus. The Western powers supported Turkey's refusal to grant the Soviets such bases. See GALLIPOLI; BOSPORUS.

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DARDANIA, an ancient district of the Troad, adjoining the territory of Ilium or Troy; also a town of that district. In Homer's *Iliad* and Virgil's *Aeneid* the Dardani were ruled by Aeneas and closely allied with the Trojans. At Dardanus (also called Dardanum and Dardanium), a later city near the site of the older Dardania, Mithridates and Sulla made a temporary peace in 84 B.C.

DARDANUS, son of Zeus and Electra, was the mythical founder of Dardanus on the Hellespont. He was ancestor of the Trojans, and through them of the Romans.

DARDISTAN, region, West Pakistan, North-West Frontier Province and Kashmir, on the S slopes of the Hindu Kush and Karakoram mountains. The region is inhabited by tribes speaking Dardic languages.

DARE, VIRGINIA, was born in 1587 on Roanoke Island in Virginia Colony (the island later became a part of North Carolina), the first child born in America of English parents. Her grandfather John White, founder and governor of the colony, sailed for England soon after her birth, and the war with Spain prevented his return. In 1591 a relief expedition was sent from England, but all trace of the colony had vanished.

DAR-EL BEIDA. See CASABLANCA.

DARES PHRYGIUS, legendary author of *De excidio Trojae historia* who, according to Homer, was a Trojan priest of Hephaestus. The work attributed to him was a principal source of early stories of the Trojan War, but it is doubtful if the Latin work had a Greek original. With the work of Dictys Cretensis, a supposed author of a diary of the Trojan War, it was the basis of a romance written in the thirteenth century by Guido delle Colonne.

DAR ES SALAAM, capital of Tanganyika, on the Indian Ocean, 45 miles S of Zanzibar. Dar es Salaam

is the largest town of Tanganyika, an important commercial center, and one of the leading seaports of East Africa. It is the ocean terminal of a railroad to Kigoma on Lake Tanganyika. Dar es Salaam has a small, landlocked harbor with modern dock facilities. The port handles much of Tanganyika's foreign trade besides serving a wide area of eastern and central Africa. Fibers, coffee, copra, hides, skins, diamonds, gold, lead, peanuts, and wax are the main exports. Industries in Dar es Salaam include the manufacture of food products, wood products, pharmaceuticals, and clothing. The town has a noted botanical garden and there is an international airport nearby. Dar es Salaam has a handsome modern quarter built in the European style, containing the government and commercial offices. The town was founded by the Sultan of Zanzibar in 1862. It was occupied by the German East Africa Company in 1887 and four years later became the administrative center of German East Africa. In 1916 the town was captured from the Germans by British forces. The name Dar es Salaam means Haven of Peace in Arabic. Pop. (1952) 99,140. See TANGANYIKA.

DARFUR, area, in the Sudan, NE Africa, bounded by Northern Province on the N, Kordofan on the E, Bahr el Ghazal on the S, and French Equatorial Africa on the W; area 138,150 sq. mi.; pop. 1,005,570.

Topography. Most of the area is a plateau rising to about 2000 feet above sea level. In its central portion are the Marra Mountains, reaching heights of more than 10,000 feet. The annual rainfall ranges from less than 4 inches in the north to between 20 and 40 inches in the south. There is a dry season from November to April and a wet season from June to October. The north and central portions have steppe vegetation, principally acacia bushes; in the south is savanna-type vegetation. A few rivers, mostly intermittent or seasonal, drain the area.

Population. The people are a mixture of Arab and Negroid stocks. Moslemism, introduced around the beginning of the fourteenth century, still predominates. The majority of the people speak Arabic. The largest town in the area is the capital, El Fasher; El Geneina is also an important center. Both towns are situated on caravan or highway routes.

Economy. The principal agricultural resources of the area are gum arabic, gathered from acacia bushes in the north, and fruits and grains, grown in the central section. Some cattle, sheep, and goats are raised, mainly in the south. The chief imports are cotton goods, sugar, and tea.

History. In 1821 the area was conquered by the Egyptians and ruled by a sultan. Various efforts to throw off Egyptian rule were tried unsuccessfully. In 1885 the forces of the Mahdi (the Mad Mullah) finally gained control (see MAHDI); about 1898 a mixed British and Egyptian force broke the Mahdist power and reconquered the area. In 1900 Ali Dinar, sultan of Darfur, on condition of payment of an annual tribute, was allowed complete autonomy within his sultanate. In 1916 he headed an unsuccessful uprising and was killed; Darfur was then incorporated into the Sudan as a province. On Jan. 1, 1956, the Sudan declared itself an independent and sovereign state. See SUDAN.

DARGOMIJSKY, ALEXANDER SERGEIVICH, 1813–69, Russian composer and pianist, was born in Tula and by the age of 20 was a brilliant pianist. He held a position in the government from 1831 to 1835 but after that time devoted himself entirely to music. From 1845 to 1855 he published more than 100 minor works (songs and ballads) which met with great popularity; in 1856 his best known opera, *Russalka*, was produced. Dargomijsky was, with Glinka, the founder of the Russian National School of Music. In his later works, especially the opera *The Stone Guest* (produced posthumously in 1872), the music is subordinated to the words and action.

DARIEL. See DARYAL PASS.

DARIEN, town, SW Connecticut, in Fairfield County, near Long Island Sound, on the New York, New Haven, and Hartford Railroad and on U.S. Highway 1; 4 miles ENE of Stamford. Darien is a residential suburb of New York City, and a summer resort. Pop. (1950) 11,767.

DARIEN. See PANAMA.

DARIEN, GULF OF, an inlet of the Caribbean Sea, off the coasts of NE Panama and NW Colombia, about 80 miles long and 20 miles wide. The southern section is generally known as the Gulf of Urabá.

DARIEN SCHEME, a proposal for trade and settlement under Scottish auspices, 1695–1700, on the Isthmus of Panama, then called Darien. William Paterson, a founder of the Bank of England, and others obtained a charter from the parliament of Scotland for a trading company in 1695. Trade rivalry and fear of Spain forced the withdrawal of English support but the stock was well subscribed in Scotland. Three expeditions were sent out to the isthmus in 1698–99. The unhealthful climate and lack of supplies forced the first two to give up; the third drove off one attack by Spanish forces but, yielding to a second, withdrew in April 1700. The failure embittered many Scots against England. but at the same time helped persuade men in both countries of the need for union. See SCOTLAND, *William's Reign.*

DARIO, RUBEN, 1867–1916, Nicaraguan poet and leader of *modernismo*, a nineteenth century movement in Latin American literature. Born in Metapa of Indian-Negro-Spanish parentage, he received a Jesuit education, but was both pagan and Catholic in his art and life. He married twice; a third liaison, which produced a son, was his most stable relationship. Constantly moving, he lived in New York, Buenos Aires, and finally Paris, which became his home. He was active in Spanish letters and spent some time in Mallorca and Madrid. His first important work, *Azul* (Blue), appeared in 1888. Other notable work includes *Prosas profanas* (1896), *Cantos de vida y esperanza* (1905), and an autobiography in 1916. He was consciously a follower of the French symbolist poet Paul Verlaine (whom he resembled artistically, morally, and even physically), but he was also influenced by the Parnassians and the Romantics. Enamored of the archaic in general, of classic paganism, of medieval Spanish Christianity with its "flaming asceticism," his was a romantic ideal of beauty. His verse technique was both musical and involute, as shown in his best single poem, *Los cisnes* (Swans). He left a permanent mark on Spanish and Latin American lyric verse. ANTHONY KERRIGAN

DARIUS I or **DARIUS THE GREAT,** 556?–?486 B.C., king of Persia, succeeded Cambyses and ruled from 521 to 486 B.C., strengthening and extending the Persian Empire. Darius divided the country into 20 satrapies, each with three rulers independent of one another (a satrap, a general, and a minister of internal affairs), all responsible to the king alone. He also introduced a fixed tribute from each satrapy, built Persepolis, established a postal system, and constructed new roads and public buildings. About 515 B.C. he subdued Thrace and advanced north of the Danube into Scythia (southern Russia). His general, Megabyzus, made the kingdom of Macedonia the vassal of Persia. In 499 B.C. the Ionian Greeks revolted with the aid of an Athenian force, but the rebellion was ended by a Persian victory at Lade and the destruction of Miletus in 494. Darius then sent to Greece an expedition under Datis; after destroying Eretria, Datis was defeated in 490 at Marathon. Before he could complete his preparations for conquering Greece, Darius was called to Egypt by a revolt; he died shortly afterward. The principal source for the history of Darius is his own account of his conquests. See BEHISTUM.

DARIUS II, OCHUS or **NOTHUS,** died 404 B.C., king of Persia, a natural son of Artaxerxes I. He ruled from 424 to 404 B.C., having obtained the throne by

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Darjeeling lies among the foothills of the Himalayas, in one of northern India's quality tea growing areas. The town is an important stop on the route to Himalayan peaks.

murdering his brother Sogdianus. A weak ruler, he was forced to quell repeated insurrections of his satraps.

DARIUS III, CODOMANNUS, died 330 B.C., king of Persia, the last of the Achaemenian dynasty. He reigned from 336 to 330 B.C., when, after several defeats in battle, he was dethroned by Alexander the Great. Darius then fled to one of his eastern provinces, where he was slain by a satrap.

DARJEELING, town, NE India, in the state of West Bengal, capital of the district of Darjeeling, in the foothills of the Himalayas, 320 miles N of Calcutta. Darjeeling is a communications, health, and resort center. The town is located at an elevation of about 7000 feet and on clear days commands a magnificent view of such Himalaya peaks as Kanchenjunga and Mount Everest. Industries in the town include the processing of tea and other agricultural produce, and the manufacture of wood and metal products. Darjeeling has several schools, sanatoria, and a botanic garden. The town was developed by the British during the nineteenth century. Pop. (1951) 33,605.

DARK AGES, a period of European history extending from the decline of the Roman Empire in the West to the rise of medieval civilization, beginning in the fourth or fifth century and ending between the ninth and eleventh centuries, so called from the belief that the light of civilization was dimmed or extinguished across those centuries. Later historians were inclined to reject the name and to stress the creative character of these centuries, and the continuity of many aspects of life from Greece and Rome through the Middle Ages into modern history. See also MIDDLE AGES; CHARLEMAGNE.

DARK AND BLOODY GROUND. See KENTUCKY, History.

DARK HORSE, in American politics a candidate with little previous mention or public attention who is nominated for public office, especially the presidency, generally following a convention deadlock between the leading contenders. The dark horse is often a person who has made few enemies because he has been relatively inactive in public life. Typical dark horse candidates later elected to the presidency were James K. Polk in 1844, Franklin Pierce in 1852, and James A. Garfield in 1880.

DARLAN, JEAN LOUIS XAVIER FRANÇOIS, 1881–1942, French naval officer and political figure, was born in Nérac. In 1942, when U.S. troops invaded North Africa, Darlan was recognized as the French chief of state in North Africa. His surrender of Algiers ended French resistance. He was shot and killed by an assassin on Christmas Eve.

DARLING RANGE, range of low mountains, Western Australia, extending for about 200 miles in a north-south direction, parallel to the SW coast. Mt. Cooke (1910 feet) is the highest point.

DARLING RIVER, SE Australia, formed by the confluence of the Dumaresq and the Macintyre rivers at the New South Wales-Queensland borders, about 175 miles SW of Brisbane; the river flows in a generally SW direction for its entire course, joining the Murray River about 12 miles WNW of Mildura; total length, 1910 miles. Its main tributaries are the Warrego, the Namoi, and the Bogan rivers. Several dams have been constructed to regulate its flow and for irrigation.

DARLINGTON, town, NE South Carolina, county seat of Darlington County, on the Atlantic Coast Line and the Seaboard Air Line railroads, on U.S. Highway 52; 36 miles NE of Sumter. Darlington is a market center for the surrounding agricultural area of cotton and tobacco. Manufactures include furniture, printing, and textiles; the city also has cottonseed oil and flour processing industries and tobacco warehouses. Pop. (1950) 6619.

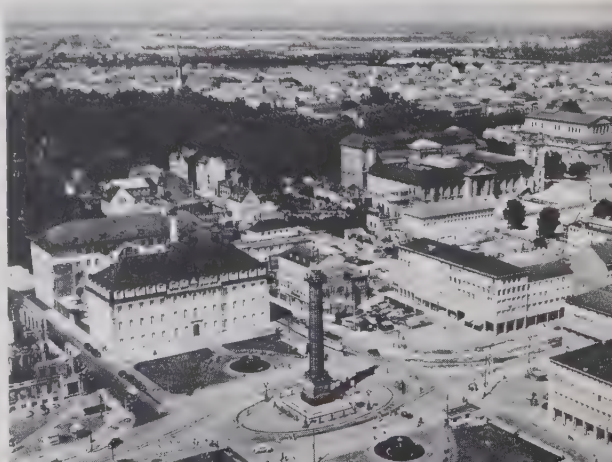
DARLINGTON, county borough, N England, in S Durham, on the Skerne River near its confluence with the Tees, 18 miles S of Durham. Darlington is a railroad junction and an important center for the manufacture of iron and steel, locomotives, railroad coaches, machinery, electrical equipment, leather and textiles. Coal is mined in the vicinity. The city contains an early English church dating from the twelfth century, a sixteenth century grammar school, and technological and teachers colleges. Darlington was the western terminus of the Stockton and Darlington Railway, which opened in 1825. George Stephenson's famous locomotive No. 1, said to be the first steam engine to pull a string of cars on a public railroad system, is preserved in a railroad station in Darlington. Pop. (1951) 84,861.

DARMESTETER, JAMES, 1849–94, French Orientalist, was born in Château-Salins. In 1885 he became professor of Iranian languages and literature at the Collège de France, leaving for India the following year for research on the Afghan language and literature. Darmesteter wrote numerous works on Oriental subjects, and translated into French the English poems of his wife, Agnes Mary Frances Darmesteter, 1857–1944 (who married Émile Duclaux, director of the Pasteur Institute, in 1901). James' brother, Arsène Darmesteter, 1846–88, a philologist, compiled (with Adolphe Hatzfeld and Antoine Thomas) *Dictionnaire général de la langue française* (1890–1900).

DARMSTADT, city, W Germany, in the state of Hesse; on the Darm River; 17 miles S of Frankfort am Main. The city is located near the northern edge of the Oldenwald highlands. A fourteenth century castle is one of the landmarks of the old town. Other points of interest include a museum, an art gallery, a large Stadtkirche (church), the new palace (1862–

Heavily damaged during World War II, Darmstadt has been rebuilt around the monument of Grand Duke Ludwig I in the Luisenplatz. At right rear is the city's Landes Theater.

GERMAN TOURIST INFORMATION OFFICE



65), and a sixteenth century town hall. Some of these buildings suffered damage in the heavy bombardment of the city during World War II. The Darmstädter Bank, a prominent financial institution prior to World War II, is located here as is Darmstadt Technical Institute, founded in 1836. The city is a railway junction and has railway shops. Diesel motors, machinery, pharmaceuticals, textiles, plastics, radios, and stoves are the principal manufactures and oil-bearing slate is quarried nearby.

First mentioned in the eighth century, the village passed to the counts of Katzenellenbogen in 1257 and was chartered in 1330. It was deeded to the landgraves of Hesse in 1479. During the Schmalkaldic War the castle was damaged in 1546; it was later reconstructed and became the residence of the Hesse-Darmstadt line, 1567 to 1918 (see Hesse-Darmstadt). At the end of World War I Darmstadt became the capital of the Free State of Hesse and of the province of Starkenburg. Following World War II the state of Hesse was reconstituted and the capital moved to Wiesbaden. Pop. (1953) 113,800.

DARNEL GRASS, perennial weed native to Europe and commonly found in grain fields and waste places throughout the United States. Darnel grass, *Lolium temulentum*, may reach a height of 4 feet. Its leaves are about 10 inches long and ¼ inch wide. It is related to rye grass. See Rye Grass.

DARNLEY, HENRY STEWART, LORD, 1545–67, Scottish nobleman, grandson of Henry VII of England. Darnley married his cousin Mary Queen of Scots in 1565, but soon alienated the queen by his arrogant stupidity, profligacy, and especially by his part in the murder of the queen's secretary, David Rizzio, of whom he was violently jealous. He further angered Mary by refusing to attend the baptism of her son (who later became James I of England). Darnley was murdered by order of the Earl of Bothwell. See Mary Queen of Scots.

DARROW, CHESTER WILLIAM, 1893– , U.S. physiological psychologist, was born in Ft. Plain, N.Y., studied at the University of Chicago, and taught at several American universities. He is best known for his studies of secretory, electrical, and circulatory responses to stimulation; the effect of convulsion therapy on autonomic and electroencephalographic responses of animals and schizophrenic human beings; and various psycho-physiological aspects of personality. He wrote *Some Physiological Conditions of Efficiency* (1927), *Reaction Tendencies Relating to Personality* (with Lena L. Heath, 1932), and other works.

DARROW, CLARENCE SEWARD, 1857–1938, U.S. lawyer, was born in Kinsman, Ohio. After practicing law in Ashtabula, Ohio, Darrow moved in 1888 to Chicago. In that city he developed the lucrative law practice he later renounced to become defender of the underdog. In 1894 he resigned as general counsel of the Chicago and North Western Railroad and successfully defended the Socialist leader Eugene V. Debs, who was charged with conspiracy in the Pullman strike. An unstinting friend of labor, Darrow was chief counsel for the coal miners in the anthracite strike arbitration at Scranton and Philadelphia, Pa., 1902–03. But it was as an implacable foe of capital punishment that he achieved his greatest international prominence for his often dramatic, always brilliant, defenses of persons charged with murder: out of more than 100 cases no client of his was executed. In 1907 his defense of William J. (Big Bill) Haywood and other labor leaders accused of murdering former Gov. Frank Steunenberg of Idaho was successful against the prosecution of the renowned William E. Borah. Darrow had been prominently identified with the Socialists but lost their favor when he entered a plea of guilty for the McNamara brothers in their trial, 1911, on the charge of having dynamited the *Los Angeles Times* building the year before.

UP

Clarence Darrow

One of Darrow's most widely publicized cases was his defense of Richard Loeb and Nathan Leopold in Chicago, 1924; they were saved from execution for a thrill murder by a plea of temporary insanity and a moving summation by Darrow. In 1925 Darrow headed the defense of John Thomas Scopes, of Dayton, Tenn., who was charged with teaching the doctrine of Darwinian evolution in a public school. An agnostic, Darrow appeared against William Jennings Bryan, who acted both as prosecutor and as witness for the fundamentalist interpretation of the Bible. Darrow in cross-examining Bryan did much to discredit Bryan's testimony. Although Scopes was found guilty, the trial actually was a victory for Darrow and a defeat for Bryan, who dropped dead shortly thereafter. The drama *Inherit the Wind* (1955) was based on the Scopes "monkey trial." Darrow wrote *Crime, Its Cause and Treatment* (1925), *The Story of My Life* (1932), and, with Wallace Rice, *Infidels and Heretics* (1933). See Scopes Trial.

D'ARSONVAL, JACQUES ARSÈNE. See Arsonval, Jacques Arsène d'.

D'ARSONVAL MOVEMENT, a mechanical system that forms the basis for many instruments used to detect the presence of an electric current, to measure electromotive force, and to measure current. It consists essentially of a coil of fine wire pivoted in the field of a permanent magnet. See Galvanometer.

D'ARTAGNAN. See Artagnan, Charles de Baatz, Count d'.

DARTER, an aquatic bird belonging to the family *Anhingidae*. The members of this family, also known as snakebirds, water turkeys, and anhingas, are similar to the cormorants (see Cormorant) and are usually found in the swampy tropical and semitropical regions of the world. The American darter, *Anhinga anhinga*, is about 3 feet in length. Its bill is long and straight, its head small and compressed. The neck is long, slender, and bent at the eighth vertebra; the special muscle arrangement of the neck enables the bird to make powerful thrusts with its bill in capturing live fish. The body is slender, the wings long and pointed, and the tail fan-shaped. The male is black and the female brownish black with a gray-brown head, neck, and breast. A good flier and diver, the darter swims with its body submerged and its snakelike head and neck extending above the surface of the water.

DARTER, any one of several small fishes belonging to the perch family, *Percidae*, and found in streams and ponds of eastern North America. Usually colored black and yellow, these fishes are 1 to 5 inches long. The name darter is derived from the manner in which they swim. Common types are the rainbow darter, *Poecilichthys caeruleus*, johnny darter, *Boleosoma nigrum*, and least darter, *Microperca microperca*.

DARTFORD, municipal borough, SE England, in NW Kent, on the Darent River, 15 miles ESE of London. Dartford is a residential and minor industrial center. Industries in the town include the manufacture of food products, paper, chemicals, metal goods, cement, and leather. The town contains an ancient parish church with a Norman tower and a sixteenth century grammar school. Dartford was the starting point of Wat Tyler's Rebellion in 1381. During the sixteenth century England's first paper mill was established here. Pop. (1951) 40,544.

DARTMOOR, upland region, SW England, SW Devonshire. Dartmoor is a wild, bleak plateau with an average elevation of about 1500 feet. Numerous

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Dartmoor Prison at Princetown, built as a military prison in 1806, is now used for English convicts. Primarily a grazing area, Dartmoor is the site of prehistoric remains.

granite peaks or "tors" rise above the tableland, including High Willhays (2039 feet) and Yes Tor (2028 feet). The area is mainly covered with heather but there are extensive woodlands and marshes. Sheep and cattle raising is the main occupation on the moor. Minerals occurring in the region include tin, kaolin, copper, manganese, and iron. The region is rich in prehistoric relics and is noted for its wild ponies. Dartmoor Prison, one of England's major penitentiaries, is located at Princetown.

DARTMOUTH, town, SE Massachusetts, in Bristol County, on Buzzards Bay, on the New York, New Haven, and Hartford Railroad; 6 miles WSW of New Bedford. Situated in a farming and dairying region, Dartmouth is noted for the processing of dairy products. It is a resort center. Pop. (1950) 11,115.

DARTMOUTH, town, SE Canada, in the province of Nova Scotia, in Halifax County; on the east bank of Halifax Harbor, an inlet of the Atlantic Ocean; on the Canadian National Railway. It is connected by ferry to Halifax, across the harbor. Dartmouth is an industrial center with flour mills, oil and sugar refineries, and factories making cordage, metalware, iron products, and carbonic gas. Founded in 1751, the town was an important whaling port in the late eighteenth century. Pop. (1951) 15,037.

DARTMOUTH, municipal borough, SW England, S Devonshire, on the estuary of the River Dart, 9 miles SSW of Torquay. Dartmouth is a seaport, market town, and resort center. The estuary of the Dart forms a spacious and protected harbor. Dartmouth is the site of the Royal Naval College (founded 1905). The town contains numerous old buildings, including a church dating from the fourteenth century and a fifteenth century castle. During the Middle Ages Dartmouth was a major seaport and in 1190 was the port of embarkation of a crusade led by Richard I, Coeur de Lion. Pop. (1951) 5842.

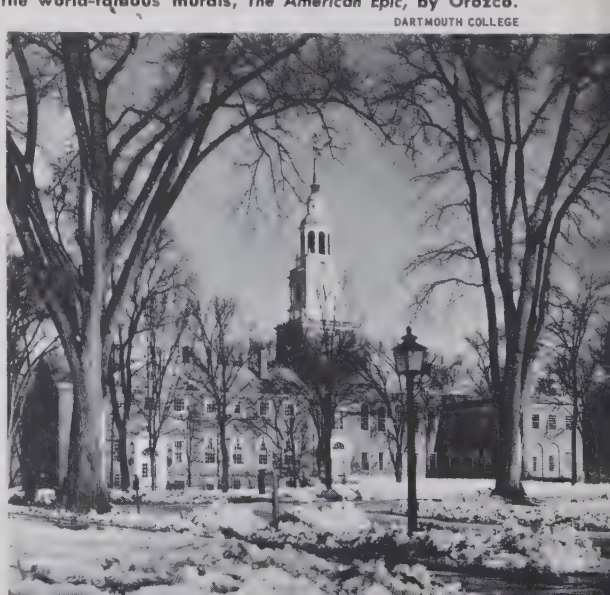
DARTMOUTH COLLEGE, an institution of higher education for men at Hanover, N.H., developed from a school for the education of "youth of the Indian tribes" and "also English youth and any others" established by the Rev. Eleazar Wheelock in 1754 at Lebanon, Conn., and known as Moor's Indian Charity School. Funds for the maintenance of the school were received from private sources, from the general courts of Massachusetts Bay and New Hampshire, and from England, where £10,000 was raised and placed in charge of a board of trustees headed by the earl of Dartmouth. As a result of this endowment the institution was moved to its present site and chartered as a college in 1769, with Dr. Wheelock as its first president, Moor's school having been made an independent institution. Dartmouth now includes the college, the Amos Tuck school of business administration, the Thayer school of engineering, and the medical school. The collegiate courses lead to the bachelor's degree in arts and science. Degrees of M.A., M.S., C.E., and M.C.S. are also granted. Dartmouth offers a number of prizes and scholarships to qualified students. The principal campus buildings are Parkhurst Hall, housing most of the administrative offices; Carpenter Art Galleries; Dartmouth Row, comprising four classroom buildings; Memorial Field, a memorial to Dartmouth men who gave their lives in World War I; and Baker Library. See COLLEGES AND UNIVERSITIES; DARTMOUTH COLLEGE CASE; WHEELOCK, ELEAZAR.

DARTMOUTH COLLEGE CASE, officially *Trustees of Dartmouth College* v. *Woodward*, an important case involving college and corporate charters decided by the U.S. Supreme Court in 1819. Dartmouth College was chartered by the king in 1769, with legal power vested in 12 trustees. In 1816 the trustees removed the president, John Wheelock, after disagreements including religious and political differences. The matter became a party issue in New Hampshire. The state legislature, sympathetic to Wheelock, enacted a revision of the college charter, increasing the number of trustees, strengthening state control of the college, and changing the name to Dartmouth University. The board of trustees refused to accept this enactment, and for a period there were two boards and two institutions claiming to be Dartmouth. When William Woodward, the secretary and treasurer, joined Wheelock and the new board, the old board sued to recover the college papers and property which Woodward took with him. The New Hampshire courts decided in favor of Woodward, and the case was taken to the Supreme Court of the United States, where the New Hampshire courts were reversed. The court, in a decision written by Chief Justice John Marshall, held that the charter was essentially a contract between the state and the college, and that the effort to modify it was a violation of Article I, Section 10 of the Constitution of the United States, which prohibited state legislation impairing the obligation of contracts. The result was that the old board of trustees recovered the college papers and property from Woodward. The decision was important in protecting the charters of corporations generally, but its effect was limited by later decisions. See SUPREME COURT OF THE UNITED STATES, Historic Decisions; CONTRACT.

DARWEN, municipal borough, N England, central Lancashire, 3 miles S of Blackburn. Darwen is noted for the manufacture of cotton goods; other manufactures include machinery, paper, chemicals, and bricks. Pop. (1951) 30,827.

Baker Library at Dartmouth College is the largest undergraduate college library in the United States. Here are the world-famous murals, *The American Epic*, by Orozco.

DARTMOUTH COLLEGE



DARWIN, CHARLES ROBERT, 1809–82, English naturalist and coformulator (with Alfred Russel Wallace) of the theory of natural selection, was born at Shrewsbury. He was the grandson of Erasmus Darwin, scientific writer of note, and the son of Dr. Robert Waring Darwin; his mother, daughter of the famous potter Josiah Wedgewood, died when he was eight years old. Darwin was educated at Edinburgh, and was at Christ College, Cambridge, from 1827 to 1831. Through the influence of his botany professor, John S. Henslow, he was appointed naturalist to H.M.S. *Beagle*, for a projected two-year cruise around the world. Instead, the trip took five years, 1831–1836, and Darwin was able to make scientific studies along both coasts of South America, at Galápagos, Tahiti, New Zealand, Australia, Tasmania, Keeling Island, Mauritius, Brazil, and the Azores. His work on geology and the coral islands he visited subsequently became the subject of several books. The trip was epoch-making, for it finally turned him to a scientific career. Later he was to say: "I have always felt that I owe to the voyage the first real training or education of my mind."

PAUL'S PHOTOS
Charles R. Darwin

As a British scientist Darwin is ranked with Sir Isaac Newton, beside whom he is buried in Westminster Abbey. His success emanated from the unbounded patience of his approach (he spent 25 years studying the earthworm), his industry in observing and recording facts, and as he put it, "a fair share of common sense." Of himself, Darwin wrote, significantly: "I have steadily endeavoured to keep my mind free so as to give up any hypothesis, however much beloved, as soon as facts are shown to be opposed to it." Ten years elapsed before the records of the voyage were published, and another 22 were required to digest what he had learned before he published his important book, *Origin of Species*. He found no short cuts in science. His *Journal* appeared first in 1839; later as *A Naturalist's Voyage Round the World in H.M.S. Beagle* (1860), it became a classic of travel writing. On January 29, 1839, Darwin married his cousin Emma Wedgewood and, after a short stay in London, retired in September 1842 to Down, Kent. It was here that he gave himself up to a lifelong study of the transformation of the species of living things.

In 1837 he had written: "In July opened first note-book on transformation of species. Had been greatly struck on the character of various South American fossils, and species of living things on Galapagos Archipelago. These facts are the origin of all my views." His doctrine of natural selection, one of several theories of evolution, is perhaps the greatest single scientific generalization of the nineteenth century. Darwin saw that if mankind is constantly being pressed for food, as Thomas Malthus had argued in his *Essay on the Principle of Population*, so, too, are plants and animals; and the struggle for existence in nature becomes so fierce that only the fittest can survive. As Darwin put it: "Nature selects those best adapted to the environment and allows them to survive and transmit their peculiarities to their descendants."

In 1859 appeared *On the Origin of Species by Means of Natural Selection*, which was in reality merely an abstract of a vast accumulation of material he had made over the years. In this book Darwin refrained from applying the doctrine of evolution to man, though the inference was plain. Twelve years later, in 1871, he did publish *The Descent of Man, and Selection in Relation to Sex*, in which he maintained that man, too, had evolved from simpler forms of life. Darwin's supplementary theory of selection was less widely accepted than his theory of natural selection. At no time did Darwin ever say that man was related to the ape or monkey. He indicated that both had a common ancestor: "We must not fall into the error," he wrote, "of supposing that the early progenitor of the whole Simian stock, including man, was identical with, or even closely resembled, any existing ape or monkey."

Between 1859 and his death the world came to realize his greatness and assimilated his main ideas. He had an intellect of the first order; his character was modest, kindly, gentle, generous, and as a personality he was shy and retiring. Darwin himself never entered the arena to defend his theories. But he had many staunch supporters, none more brilliant than Thomas Henry Huxley, who aggressively defended the doctrine of natural selection on all occasions and against all comers. Physically, Darwin was never robust after the rigors of the five-year voyage of the *Beagle*, but his industry was remarkable. His botanical works included: *On the Various Contrivances by Which British and Foreign Orchids Are Fertilized by Insects* (1862); *The Effects of Cross and Self-Fertilization in the Vegetable Kingdom* (1876); *The Different Forms of Flowers or Plants of the Same Species* (1877); and *The Power of Movement in Plants* (1880), which was a corollary to his *The Movements and Habits of Climbing Plants* (1865). Among his zoological works, apart from his popular Beagle Journals, are: *A Monograph on the Cirripedia* (1851–53); *Fossil Balanidae and Verruccidae* (1854); and *The Formation of Vegetable Mould Through the Action of Worms* (1881). He also wrote many works on geology, including *The Structure and Distribution of Coral Reefs* (1842), *Geological Observations on the Volcanic Islands Visited During the Voyage of H.M.S. Beagle in South America* (1846), and others.

Charles Darwin was honored by the chief scientific societies of the world, and received an honorary degree from Cambridge in 1877. Two daughters and five sons survived him, four of the latter becoming prominent in the scientific world, especially Francis, who became his biographer, and Leonard, who attained prominence as an economist. See EVOLUTION; NATURAL SELECTION; WALLACE, ALFRED RUSSEL.

HERBERT F. WEST

DARWIN, city, N central Australia, capital of the Northern Territory, on Port Darwin, an inlet of the Timor Sea; 1760 miles NW of Brisbane. Darwin is the chief city and port in the Northern Territory. Its principal industries are the export of cattle, meat products, and peanuts; and pearl shells and other sea products. Darwin is connected by railway to Birdum, by highway to Adelaide, and also has international air service. In 1839 Darwin was named for the scientist Charles Darwin, but settlement did not begin until 1869. During World War II the city was an important supply and personnel depot for the Allied forces. The first city in Australia to be bombed by the Japanese, it was heavily damaged by raids in the early part of 1942. Pop. (1954) 8071.

DARYAL PASS or **DARIEL,** gorge in the Greater Caucasus, in Georgian Soviet Socialist Republic, cut by the Terek River, forming the main pass between the city of Dzaudzhikau in the Grozny Region and the city of Tiflis (Tbilisi) in Georgian Soviet Socialist Republic. The Georgian Military Road traverses the gorge. The pass is about 6000 feet above sea level. The Daryal ravine has been called the Caucasian or Iberian Gates by classic authors. See CAUCASUS.

DASHT-I-KAVIR, desert region, N central Iran, on the Iranian plateau. The area is almost wholly lacking in precipitation; its surface is covered by a salt crust under which are salt marshes or mud. The only settlements are located on the margins of the region.

DASHT RIVER, seasonal stream, in West Pakistan, rises in the Central Makran Range, flows SW

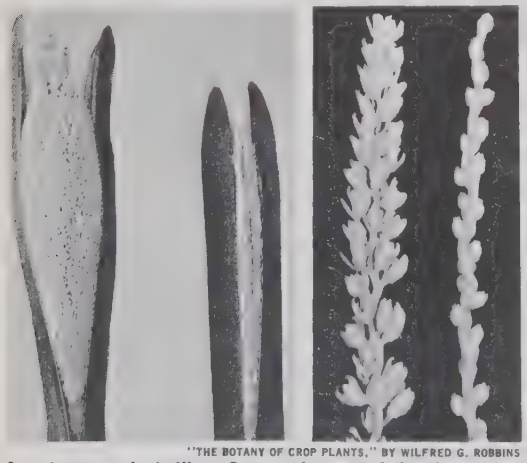
for its entire course of about 270 miles, and empties into Gwatar Bay, an inlet of the Arabian Sea. Irrigated crops are found along its middle course.

DASPALLA, former princely state, E India, in the state of Orissa since 1949. The capital was Kunjabangarh. Daspalla was founded in 1495. Its ruling house was descended from the Bhanj family of the Salar dynasty.

DASS, PETTER, 1647–1708, Norwegian clergyman and poet, was born on the island of Nord Herö, the son of an immigrant Scottish merchant. After 1689 he was pastor of the parish of Alstadhaug in northern Norway. Dass was known as the father of modern Norwegian poetry. Most of his works were read in manuscript, or told from memory. In all he wrote 127 poems. His chief work, *Nordlands Trompet*, is the folk story in rhyme of the province of Nordland. Dass' collected writings were edited, 1873–77, by A. E. Erikksen.

DASYURUS, or marsupial cat, a genus of weasel-like animals native to Australia and New Guinea (see Marsupial). About a foot in length, the animal has a bushy tail nearly as long as its body. Its coat is reddish or brown, spotted with white; its ears are pointed. The marsupial cat is an excellent nocturnal hunter, stalking rats, lizards, poultry, and insects. During the day it remains in its den, usually in a hollow tree. There are about 24 young to a litter.

DATE, a sweet nutritious fruit, eaten cooked or raw, produced by many varieties of *Phoenix dactylifera*, a tree belonging to the palm family, *Palmaceae* (see Palm). The date palm is considered a native of North Africa or western Asia and it is believed that the tree was growing wild as long as 5000 years ago in the area now known as Iraq. The trees, probably planted by nomadic tribes, were known to have extended in a narrow belt from the Euphrates River to the Canary Islands. From this original area of distribution, the date palm was introduced into China and was taken to the Western Hemisphere by early Spanish missionaries.



"THE BOTANY OF CROP PLANTS," BY WILFRED G. ROBBINS

Staminate and pistillate flower clusters of the date palm are shown just emerging from their spathes in photo at left. Staminate and pistillate flowers are shown at right.

Dates are the staple food of the desert peoples of Africa and parts of Asia. They are eaten raw, dried, or cooked; the Arabs also grind them into meal, which is stored for future use. On the average, 100 pounds of dried dates provide two pounds of protein, 20 pounds of water, and 75 pounds of carbohydrate. Dried dates also contain about 80.6 calories per ounce and important quantities of iron, potassium, calcium, and phosphorus.

The date palm lives to a great age and attains a height of 60 to 80 feet. The flowers are borne in white or yellow spikes; the leaves are 10 to 20 feet long and live three to seven years. The tree can grow in a variety of soils, although it seems to do best in a slightly alkaline sandy loam, provided its climatic and water requirements are satisfied. The fruit will not ripen unless the hot summer season is long and the relative humidity low during the maturation period. In the United States dates are grown principally in California and Arizona, and to a lesser extent in southern Texas. Since the date palm produces staminate (male) and pistillate (female) flowers on separate trees, it is necessary to insure the fertilization of the female flowers artificially for purposes of cultivation. Such fertilization is accomplished by cutting sprays of pollen-bearing flowers when the pollen is ripe and affixing them to the female flowers. The tree is propagated by seeds or by offshoots which develop from axillary buds on the trunk. The more or less oblong fruits, often translucent and amber colored, are borne in clusters of about 200; the stone, somewhat cylindrical, is grooved on one side.

AMERICAN MUS. OF NATURAL HIST.

Heavily laden date palms give promise of a good yield in an orchard at Indio, Calif. Normally a tree will produce from 100 to 200 pounds annually for 100 years or more.

DATE LINE. See Time, Measurement of.

DATE PLUM. See Persimmon.

DATIA, former princely state, N central India, in the state of Vindhya Pradesh. The state was created by a Rajput chief in 1626. Under British control after 1802, it became part of the Indian state of Vindhya Pradesh in 1948.

DATIVE. See Case.

DATOLITE, a colorless to pale green mineral crystallizing in the monoclinic system (see Crystallography). Datolite, $CaBSiO_4OH$, has a specific gravity of 2.8 to 3 and a hardness (see Hardness) of 5 to 5.5 and is transparent to translucent. It usually occurs in association with other minerals. In the United States datolite has been found associated with copper deposits in the Lake Superior region and with trap rocks in Westfield, Mass., and Bergen Hill, N.J.

DATURA. See Jimson Weed.

DAUBENTON, LOUIS JEAN MARIE, 1716–?1800, French naturalist, was born in Montbard. He is known chiefly for his anatomical descriptions of mammals in Georges L. L. de Buffon's *Histoire Naturelle* (1749–1804). Daubenton introduced Merino sheep into France.

D'AUBIGNÉ, JEAN HENRI MERLE. See Merle d'Aubigné, Jean Henri.

DAUBIGNY, CHARLES FRANÇOIS, 1817–78, French landscape painter and etcher, was born in Paris, a son of the painter Edward Daubigny. He studied with his father and later under Delaroche. In 1848 he built his famous houseboat, the *Botin*, on which he lived from season to season, painting nature under all conditions. His intense love of nature and sympathy with its many phases are strikingly evident in *Vintage* and *Springtime*.

D'AUBUSSON. See Aubusson, Pierre d'.

DAUCUS. See Carrot.

DAUDET, ALPHONSE, 1840–97, French novelist, dramatist, and poet, was born in Nîmes, and studied briefly at the *lycée* of Lyons. His autobiography, *Le petit chose* (1868), tells of his poverty-stricken childhood and his struggle for an education. Having worked as an usher (and finding it intolerable), he went to Paris at the age of 17, determined to make his place in the world of literature. Shortly after *Les Amoureuses* (1858), a volume of poetry, was published, he began to contribute to *Le Figaro* and won the patronage of the Duc de Morney. Thus began a long and successful career in writing. Except for his attempts at drama (*L'Arlésienne*, 1872, and *Sapho*, 1884, both dramatizations of his novels), almost everything Daudet wrote was an immediate success. His literary production, however, was not of consistently high quality; the early provençal tales, such as *Lettres de mon moulin* (1866), and the delightful *Tartarin de Tarascon* (1872), were probably his best and most sincere works. *Sapho* (1884) in its original form as a novel is also often thought of as being in this class (and the work was indubitably important as marking Daudet's movement away from merely episodic work). *Contes de Lundi* (1872–73), tales of the Franco-Prussian war, often degenerate into ultra-patriotic sentimentality and so lack Daudet's most engaging quality—a fresh, naturalistic approach. Naturalism in Daudet's work is not prosaic, as it often is in the writings of Zola; Daudet's naturalism is almost impressionistic—full of light and color, with a unique charm.

Daudet is often compared to Dickens because of the frequent similarity of his subject matter to that of the Englishman; the downtrodden, poor, abused children and comic types which verge upon caricature are common to some of the novels of both writers. But Daudet was less a reformer than Dickens; his sentimentality was designed to cajole sympathy, not to provoke righteous anger. Whatever the subject and whatever the mode, Daudet was a superb craftsman; his less-than-great poetry was always perfect in form, and even his slightest productions were written in masterfully elegant prose. When he wrote about the things he loved best his exuberant charm was unequaled. Among the best of Daudet's realistic (Dickensian) novels is *Fromont jeune et Risler aîné* (1874). His later works often reveal an antiscientific, antidemocratic, generally negative attitude. He was particularly bitter (*L'Immortel*, 1888) against the French Academy, whose "immortals" did not invite him to join them in their "temple."

RACHEL GILBREATH

DAUDET, LÉON, 1867–1942, French author and journalist, son of Alphonse Daudet, was born in Paris. With Charles Maurras he founded and edited *L'Action française* (1908), a Catholic Monarchist publication noted for its vicious invective. His writings, strongly colored by political, aesthetic, and personal antipathies, would be unimportant were it not for his memoirs, *Souvenirs de milieux littéraires, politiques, artistiques et médicaux* (1914–21), which contain deft portraits of some of the leading literary and political figures of the nineteenth century. Among his other works are *Écrivains et Artistes* (1928–29) and *Phryné* (1937).

DAUGAVPILS, or Dvinsk, also Dünaburg, city and fortress, U.S.S.R., in the SE part of the Latvian Soviet Socialist Republic, on the Dvina River, 150 miles WNW of Vitebsk. Daugavpils is an important strategical center and railroad junction. It has railroad shops, metal works, furniture and textile factories, and a food processing industry. An active trade in hemp, flax, and timber is carried on. Founded by the Teutonic knights in 1274, the city was destroyed by Russia's Ivan IV and rebuilt by Stephen Batory of Poland (1582). From 1772 to 1918 it was under Russian rule. In World War I it was the scene of bitter fighting between the Russians and Germans in 1915 and again in 1918. On the conclusion of peace between Latvia and Russia in August 1920, Daugavpils was awarded to Latvia, which was seized by the Soviet Union in 1940. In World War II Daugavpils was captured by the Nazis shortly after their invasion of the Soviet Union in June 1941; it was recaptured by the Soviet army on July 27, 1944. Pop. (1950 est.) 50,000.

DAUGHERTY, HARRY MICAJAH, 1860–1941, was born in Washington Court House, Ohio. He was attorney general in Pres. Warren G. Harding's cabinet, 1921–24. President Calvin Coolidge asked for his resignation after the Teapot Dome oil scandal was exposed. Daugherty was tried on charges of conspiracy to defraud the U.S. government, but the case was dismissed in 1927 after two juries had failed to agree. He wrote, with Thomas Dixon, *The Inside Story of the Harding Tragedy* (1932). See TEAPOT DOME.

DAUGHTERS OF THE AMERICAN REVOLUTION, a national society popularly known as the D.A.R., founded in 1890 for patriotic, historical, and educational purposes. Women are eligible for membership upon furnishing acceptable proof of descent from one or more ancestors who served the cause of independence as soldier, sailor, civil officer, or recognized patriot. The headquarters are in Washington, D.C., where the society also maintains a museum, a notable genealogical library, and Constitution Hall, an auditorium used for public concerts and meetings. The society owns and operates two schools—in Grant, Ala., and Tamassee, S.C., and assists other schools financially. The society has given attention and support to efforts to promote good citizenship among new immigrants to the United States, and in the schools by means of publications, contests, pilgrimages, and the formation of allied clubs and organizations. It has aided in the preservation and restoration of historic buildings and monuments, especially through local and state organizations.

The publications of the society include its lineage books, the *Daughters of the American Revolution Magazine*, and *Press Relations Digest*. The D.A.R. has about 180,000 members, in more than 2600 chapters.

DAUGHTERS OF THE CONFEDERACY, UNITED. See PATRIOTIC SOCIETIES.

DAUGHTERS OF THE REVOLUTION. See PATRIOTIC SOCIETIES.

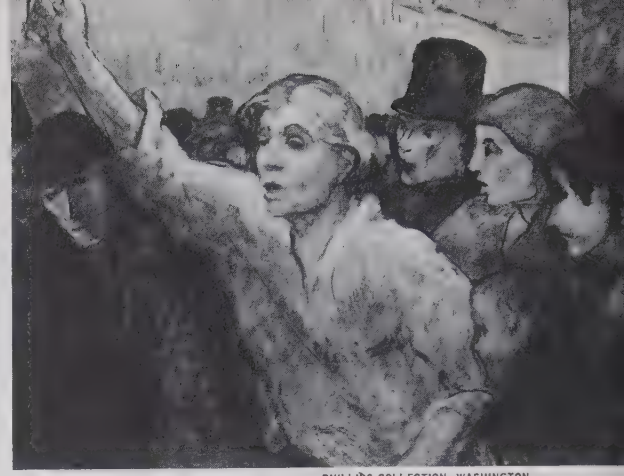
DAULATABAD, village, central India, in the state of Hyderabad; about 160 miles ENE of Bombay, near Aurangabad. The capital of a twelfth century kingdom, the village was known as Deogiri or Devagiri until 1327. It is the site of a hill fortress which figured in the Mogul conquest of the Deccan region in the seventeenth century and has outstanding examples of Indian Moslem architecture.

DAULE, city, W Ecuador, in the province of Guayas, on the Daule River; 25 miles N of Guayaquil. Daule, situated in a farming region, exports coffee and cacao. Pop. (1950) 4501.

DAUMIER, HONORÉ, 1808–79, French painter, sculptor, and lithographer, was born in Marseilles, the son of a poor glassmaker and self-styled poet. In the interests of the father's poetry the family moved to Paris, where the boy worked, mainly in the law courts, to support them. Working as a lithographer, young Honoré learned the technique of printmaking; he studied art by visiting the Louvre, where he was particularly attracted by ancient sculpture. He published his first lithographs in 1829 as a by-product of his daily labor. In 1830 he began 40 years of collaboration on republican periodicals as a caricaturist by contributing to *La Caricature;* he was soon imprisoned for six months for a caricature of King Louis Philippe entitled *Gargantua*. When the journal was suppressed he drew for *Charivari*, which took its place. To help pay the fines leveled against *Charivari*, he began to publish a series of lithographs, including *Freedom of the Press*, *The Legislative Belly*, *The Blue-Stockings*. In these he satirized all segments of society, from Bohemians to bourgeois; his caricatures

ART INSTITUTE OF CHICAGO

***An Evil Brew*, a political caricature by Honoré Daumier. In all he produced more than 4000 lithographs, one of which cost him a prison term, another a series of fines.**



PHILLIPS COLLECTION, WASHINGTON

***The Uprising*, a painting executed by Daumier during his latter years. Unappreciated in his own day, he came to be considered one of the precursors of the French modernists.**

of corrupt lawyers and judges are his most incisive and best known. After producing an estimated 4000 lithographs he turned to painting and sculpture after the Franco-Prussian War. Reminiscent of Michelangelo in the fluidity and rhythm of his line, Daumier came to be considered one of the precursors of the French modernist movement.

With his everyday (and unbeautiful) subject matter, Daumier was one of the first to ignore the canon of beauty in art and to treat of somber and squalid subjects (such as *The Washerwoman* and *The Soup*), though not in a naturalistic manner. He did not work from nature; his only model was his memory. His sure command of line, which through exaggeration and overemphasis always bordered on caricaturist (as in his paintings of print collectors and players of games), was unusual at a time when careful draftsmanship was demanded. Twentieth century criticism has come to consider Daumier's painting the most formal organization of design elements before Paul Cézanne. Unknown as a painter in his own day, Daumier had no disciples; he initiated no school. The poet Charles Baudelaire was one of the few of his contemporaries to divine his genius and, as Daumier fought poverty and blindness, the painter Camille Corot gave him a house and pension to ease his last bitter days. ANTHONY KERRIGAN

DAUPHIN, the heir to the throne of France. The medieval counts of Viennois were called *dauphin*, probably a personal name at first, later used as a title. From them their territory came to be called Dauphiné, or Dauphiné de Viennois. When Dauphiné was ceded to the king of France in 1349, one condition was that the king or his heir should bear the title dauphin. With few exceptions, the title was conferred on the heirs from 1364 to 1830. Among famous dauphins of France were the son of Louis XIV, known as Monseigneur, and the son of Louis XVI, known also as Louis XVII and the Lost Dauphin (see LOUIS XVII).

DAUPHIN, town, S central Canada, SW Manitoba, on the Vermilion River, on the Canadian National Railway; 153 miles NW of Winnipeg. Dauphin is a shipping point in a wheat producing area. Riding Mountain National Park is located 7 miles south of the town. Pop. (1951) 6007.

DAUPHINÉ, region and former province of France, bounded by Italy on the E, the Rhône River on the N and W, and the departments of Gard and Vaucluse on the S. It is now in the modern departments of Isère, Drôme, and Hautes-Alpes. Principal cities are Vienne, Valence, and Grenoble, its historic capital. Lying chiefly in the Dauphiné Alps, the region is noted for magnificent scenery.

DAUPHINÉ ALPS, western section of the Cottian Alps, SE France, between the Maritime Alps on the SE, the Graian Alps on the NE, and the Cottian Alps on the E. Its western section is known as the Massif du Pelvoux, and its highest peak is Barre des Écrins (13,461 feet). See ALPS; COTTIAN ALPS.

DAUPHIN ISLAND, barrier beach, off the coast of SW Alabama, in the Gulf of Mexico, at the end of Mobile Bay, in Mobile County; 31 miles SSW of Mobile. The island was used by the French in 1699 as a base for the colonization of Louisiana. It was seized by Gen. James Wilkinson for the United States in 1813. Fort Gaines, now Fort Gaines State Historical Site, located at the eastern end of the island, was captured by Adm. David Farragut in the battle of Mobile Bay, Aug. 5, 1864. (See MOBILE BAY, BATTLE OF.) Pop. (1950) 190.

DAVAO, province, SE Philippine Islands, SE Mindanao, bounded by the provinces of Agusan on the N, Bukidnon on the NW, and Cotabato on the W, and the Pacific Ocean on the S and E; area 7530 sq. mi.; pop. 364,854. Apart from a narrow coastal plain, Davao consists predominantly of rugged mountainous country. The province has a tropical, rainy climate and dense forests cover much of the area. Leading products of Davao include rice, fibers, coconuts, rubber, and lumber. Sulfur, gold, and iron are the principal mineral resources. The province is generally undeveloped. Davao is the leading city and capital of the province.

DAVAO, city, Philippine Islands, SE Mindanao, capital of Davao Province; on the W shore of Davao Gulf, at the mouth of the Davao River. Davao is the chief port and commercial center of southern Mindanao. Its principal exports are abacá (hemp) copra, and lumber. There is a gold mine and a pineapple plantation in the vicinity. During World War II the Japanese occupation forces established a naval base here and the city experienced heavy air bombardment from mid-1944 until May 1945, when it was recaptured by U.S. troops. Pop. 118,900.

DAVENANT or **D'AVENANT, SIR WILLIAM,** 1606–68, English poet and dramatist, was born in Oxford, the son of an innkeeper, at whose establishment (according to tradition) Shakespeare frequently stopped. Davenant succeeded Ben Jonson as poet laureate in 1638. A soldier in the Royalist army during the civil war, he eventually sought refuge in France. In 1650 he sailed for Virginia at the head of a French colonizing expedition which was apprehended by the English revolutionists. Davenant was imprisoned, 1650–52, and is said to have owed his life to the intercession of John Milton. In prison he completed his epic poem *Gondibert* (1651), begun in France. After the Restoration, he produced adaptations of plays by Shakespeare and introduced opera to the English stage. His plays include *Albovine*, *King of the Lombards* (1629) and *The Wits* (1633).

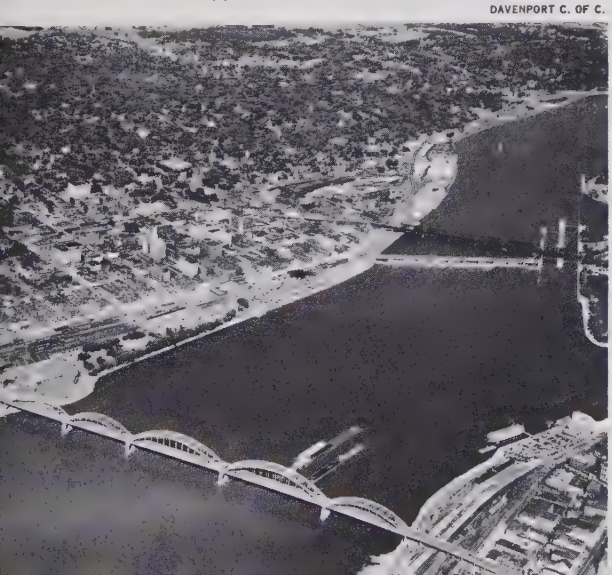
DAVENPORT, HOMER CALVIN, 1876–1912, U.S. caricaturist, was born in Silverton, Ore. After 1895 he achieved fame and political influence as a cartoonist, working successively for the *New York Evening Journal*, the *New York Evening Mail*, and the *New York American*. Davenport's representation of Uncle Sam became a popular national symbol. He wrote *The Country Boy* (1910).

DAVENPORT, JOHN, 1598–1670, American colonial clergyman, was born in Coventry, England. A minister of the Church of England, he became a nonconformist and in 1633 fled to Holland. In 1637 he led an expedition from England to Boston, and in 1638 founded New Haven, Conn., where he was pastor of the church and a leader of the colony. Davenport was pastor of the First Church in Boston after 1667.

DAVENPORT, city, E Iowa, county seat of Scott County; on the Mississippi River; on the Burlington, the Rock Island, the Milwaukee, and the Davenport, Rock Island, and North Western railroads and U.S. highways 6, 61, and 67; a scheduled airline stop; 150 miles E of Des Moines. Davenport lies across the river from Rock Island, East Moline, and Moline, Ill.; the four are known collectively as the Quad Cities. The business and industrial districts of the city are located adjacent to the river; the residential area is chiefly on the limestone bluffs to the north. Davenport is on the site of an early trading post and was the scene of a battle fought in the War of 1812. The actual fighting took place on Credit Island in the Mississippi, Sept. 5-6, 1814, now the site of a city park. Fort Armstrong was established two years later on Rock Island, now a part of Illinois. In 1836, four years after the Black Hawk Purchase was negotiated on the town's site, Col. George Davenport, a trader at the fort, founded the town that later bore his name. Davenport was the first city to be served by a railway bridge across the Mississippi River, completed in 1856. Several camps were located near Davenport during the Civil War. Following the war it prospered as a sawmilling center and a river port.

Davenport is the site of St. Ambrose College, Marycrest College, and the Palmer School of Chiropractic. The Iowa Soldiers' Orphans' Home and a museum are also points of interest. A roller gate dam and locks provide a 9-foot navigation channel and protect the industrial area from floods. Principal products include agricultural implements, aluminum sheet and plate, pumps, toys, airplane parts, food, feed, and gas and diesel engines. Pop. (1950) 74,549.

This aerial view of Davenport, Iowa, shows the roller gate flood control dam and navigation channel, and two of the three Mississippi River bridges that link the Quad Cities.
DAVENPORT C. OF C.



DAVID, 1030?–?960 B.C., ruler of the united kingdom of Judah and Israel. Historically the most influential Jewish monarch, his life span was midway between Abraham and Christ. David has his day in the Christian calendar on December 29.

His Name. "David" is usually explained simply as a personal name. However, David appears as a title for a military leader in texts of the second millennium B.C. found in the excavations at Mari (on the upper Euphrates), 1933–38. In the light of this, it is possible that he was named for the outstanding innovation he represented in Israel: for years he commanded a mercenary professional soldiery, winning his kingship and the possession of Jerusalem with the help of this system which, because of its effectiveness, he had copied from the enemies of Israel, the Philistines.

His History. David's non-Israelitic use of mercenary soldiery enabled him to rise above the jealousies of the militias of the various tribes; on the other hand, this innovation had to be reconciled with the ancient loyalties of the people. Our sources of knowledge about David's reign, in the main the two books of Samuel (in the Roman Catholic Bible the first two books of Kings), are dedicated to this reconciliation. The loyalty of David for the first King Saul and for Saul's family often seems to be their main theme. For example, the same act of loyalty—sparing Saul's life when David could have slain him—occurs several times. Obviously, the court of David and Solomon dreaded that anyone might replace David's dynasty as he had replaced Saul's; for some, David ranked as a pretender until his death. Hence in Samuel 16 we are told that the seer Samuel once came to the house of David's father Jesse (Isai) in Bethlehem and looked over all the seven sons present. But Jehovah (Jahve) told him to wait for David. When David entered, fair-haired, tall, bright-eyed, Samuel anointed him and in him recognized God's Spirit. David slew the iron-clad Goliath in a single combat with his stone sling. Later David became Saul's arms bearer and played the harp before him. And "the soul of Jonathan, Saul's son, entered into a knot with David's soul, and Jonathan held him dear as his own soul, with God between them."

Scholars say that jealousy made Saul hate David, and David fled. His farewell to Jonathan (I Sam. 20) is a sublime homage to friendship. Later David formed a guerrilla band of several hundred social outcasts and approached the Philistine prince, Achis, of Gath, who invested him as his vassal with the city of Ziklag. David was now working for the enemies of his country. The Philistines slew Saul and Jonathan while David saved his Ziklag from a raid of the Amalekites (I Sam. 28–29). When Saul's kingdom of Israel had ended, a magnificent dirge was composed and sung. The second Book of Samuel, Chapter 1, ascribes the dirge to David. In any case, David exploited the new political vacuum by moving eastward from Ziklag and receiving the anointment as king over the House of Judah in the grove of Mamre near Hebron in the south. In Hebron, the city once given to Caleb, David ruled for the next seven years (around 1000 B.C.) over the six subdivisions of Judah. Six sons were born to him in Hebron by various wives. In the meantime, the Israelitic remnants of Saul's army and family (the northern tribes) disintegrated. When they had perished (David's generals murdered some of them), the elders of Israel came to Hebron expressing their preference for David of Bethlehem rather than anarchy. David employed his mercenaries to conquer from the Canaanites the city of Jerusalem, with its northern castle Zion; here rose his palace, the City of David. Phoenicians from Tyre provided the techniques for this construction, which were as yet unknown in Israel. Then began a mighty expansion—Damascus was subdued, as was the land toward the Bay of Akaba.

David's Function in Religion

Despite such great and complex power, David built on the Mosaic traditions. He danced in jubilation in front of the Ark when it entered Jerusalem (II Sam. 6). The co-ordination of the new kingship of David and Jehovah's kingship of Israel is illustrated by (1) the role of Nathan, (2) the new literature, (3) the census.

Nathan. David's last years were ones of unending trouble arising out of the problem of succession. His son Absalom drove him out into East Jordania and reigned briefly in Jerusalem, but the army saved David. Then another son stirred up trouble; David did nothing. The decision was forced by the prophet Nathan, who had reproached David some 20 years earlier for the death of Uriah, the Hittite mercenary who lost his life at the time David committed adultery with Uriah's wife Bathsheba. Nathan had demanded that David repent and David had humiliated himself before the prophet. Now Nathan prevailed upon David to use his soldiers to install Solomon, the son of Bathsheba and himself, as his heir. Nathan also vetoed David's plan to build a temple to Jehovah; Solomon would do this. In the official annals Nathan is credited with these three measures in influencing royal decisions.

The New Literature. In this new center of spiritual power (the City of David), a Davidic literature sprang up, dealing first with David's own reign and other historical records. Obviously the new order led to taking stock of the previous days when no king stood between Jehovah and his followers, and this spiritual center organized the liturgy and the singing on Mount Zion. To David himself 75 of the 150 psalms in the Bible are attributed, and during his reign psalmody was organized.

The Census. David influenced Israel to leave its purely inner and almost incognito existence and to look at itself from the outside, as the Gentiles saw them. In addition David forced a census upon Israel. The Israelites felt that by such statistics the king's power was increased beyond the democratic way of equality, and the repentance of David over the census is twice reported in the Bible with great prominence (II Sam. 24 and I Chron. 31).

David's true greatness rests solidly on his religious and political accomplishments. He was not merely "the sweet singer of Israel." He brought the ark of the covenant to Jerusalem and established there the center of Jewish worship. He led the Israelites in expelling from their borders the last of their unsubdued enemies. He established a strong monarchy on ruins of the feeble foundation laid by Saul. And, most significant for Christians, is the fact that through the Davidic line, 10 centuries later, was to come the Messiah, in the person of Jesus Christ. See Jews, History of, *The First National State.*

Bibliog.–F. B. Meyer, *David: Shepherd, Psalmist, King* (ed. 1935); Martin Buber, *Königtum Gottes* (ed. 1936); H. N. Bialik, *And It Came to Pass* (1938); G. de S. Barrow, *David: Poet-Shepherd-Warrior-King* (1949); E. Schmid, *David* (1953); A. D. Cooper, *David* (ed. 1955); A. Maclaren, *Life of David as Reflected in His Psalms* (1955).

DAVID I, 1084–1153, king of Scotland, the son of Malcolm Canmore and St. Margaret of Scotland, succeeded to the Scottish throne in 1124. David instituted various domestic reforms, among them the consolidation of the feudal system in Scotland. He encouraged trade and the establishment of towns, built many monasteries, and created several bishoprics. His foreign policy was less successful: his attempted invasions of England in 1135, 1138, and 1140 all failed.

DAVID II, 1324–71, king of Scotland, succeeded his father Robert I (the Bruce) in 1329. As a child of nine he was sent to France for eight years, returning to Scotland in 1341. He soon made several unsuccessful raids into England on behalf of France. He was taken prisoner in 1346 and confined in the Tower of London. Later removed to Odiham, he remained there until ransomed in 1357. He had no descendants and was succeeded by Robert II, his cousin, who founded the royal house of Stuart.

DAVID, GERARD, 1460?–1523, Dutch painter, was born in Oudewater and about 1483 settled in Bruges, where his painting was much influenced by the work of Rogier van der Weyden, the Van Eycks, and Hans Memling. The last great painter of the Bruges school, David was highly regarded by his contemporaries and received many commissions from his own country and from France, Portugal, and Italy. Named town painter of Bruges in 1494, he began work on *The Judgement of Cambyses,* completed four years later. David's painting is characterized by the brilliant but subtle coloring of the Flemish school, a monumentality of design probably derived from Italian influence, and great simplicity of form and elimination of detail, with emphasis on human figures. Among his many celebrated works are the *Crucifixion* (at the Palazzo Bianco in Genoa), *The Transfiguration* (at the Bruges Cathedral), and the great *Madonna Enthroned* (at the Louvre).

DAVID, JACQUES LOUIS, 1748–1825, French painter and political figure, was born in Paris. Of well-to-do parents, he was tutored by the fashionable painter François Boucher and won the Prix de Rome in 1774. In Italy he was influenced by the painters of the Bologna school and later, when the excavations at Herculaneum and Pompeii were being made, he became passionately interested in Greek and Roman antiquities. He returned to Paris, where his historical painting *Brutus* (1789) was interpreted by the revolutionaries as a tribute to their cause and he became a leading figure in the French Revolution, which broke out the year the painting was shown. He was elected to the revolutionary convention as a Jacobin and promptly abolished the stultified Academy of Painting; he also championed art in the new state and succeeded in getting large credits voted for the purchase of paintings which were being taken out of France. He also helped found the museum which later became the Louvre, and organized the mass Republican Pageants. His portraits of the leading revolutionists were definitive in identifying those figures; the *Death of Marat* (1793) became the *pietà* of the revolutionary movement. On Napoleon's ascendancy, David became chief court painter; his masterful *Coronation* (1805–08) records Bonaparte's crowning of Josephine as empress. With the restoration of the Bourbon monarchy, David was exiled to Brussels, having been among those who voted for the death of Louis XVI. He taught art until his death, and his chief pupil and disciple, Jean Ingres, continued David's neoclassicism, or more accurately, his revolutionary classicism. David was a painter of several social classes—he painted royalty when there was a king, agitators during the republic, and Napoleon during the Empire. His feelings for each subject seemed to determine the degree of dynamism in its treatment. His portraits are classic studies; perhaps his best known is the one of Mme. Récamier (1800). He painted only one known landscape—the view from his window while he was under arrest. Most of his paintings and drawings are in the Louvre. Anthony Kerrigan

DAVID, PIERRE JEAN. See David d'Angers.

DAVID, city, W Panama, capital of the province of Chiriquí, the third largest city in Panama, on the David River, on the Pan-American Highway; it is 205 miles WSW of Panama. David, a commercial and industrial center, is linked by rail to its seaport, Pedregal, on the Pacific Ocean. Its principal industries are leather goods, especially saddles, harness, and shoes; clothing; ceramics; and sugar milling. The chief points of interest are the old park and two early churches. Pop. (1950) 14,847.

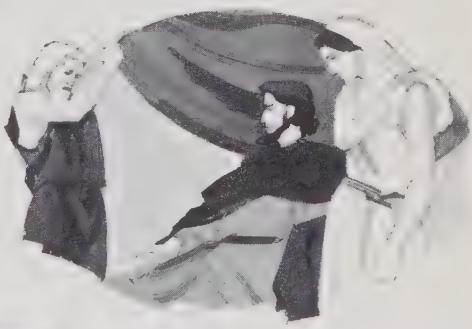
DAVID D'ANGERS, real name Pierre Jean David, 1788–1856, French sculptor, was born in Angers. A

DAVID

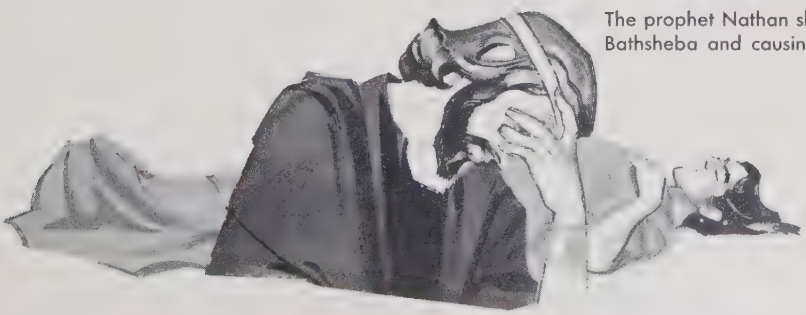
David's conquest of Goliath was a feat that proved to be the starting point of the rise of Israel to power. The army of Israel was drawn up for battle against the Philistines. Goliath, the giant Philistine, had long dared a champion of Israel to meet him in mortal combat. The lad David went out armed only with a slingshot and faith in the Lord. When David's first stone killed Goliath, the enemy fled in disorder. From that moment the destiny of David as champion of his people was clear. After the death of Saul, David reunited the tribes of Israel and led his united kingdom through many years of prosperity.

David's music relaxed the tortured mind of Saul.

Jonathan, one of Saul's sons, became David's friend.



The prophet Nathan shamed David for taking Bathsheba and causing her husband's death.



David grieved deeply over the death of his son Absalom, who had sought to usurp the throne.

pupil of the painter Jacques Louis David, he won the Prix de Rome in 1811. David's first great success was his monument to the Grande Condé. His most celebrated works are the neoclassic pediment of the Paris Panthéon and a medallion portrait of Napoleon Bonaparte. Many of his best sculptures are in the collection of the Musée David at Angers.

DAVID LIPSCOMB COLLEGE. See Colleges and Universities.

DAVIDSON, ANDREW BRUCE, 1831–1902, Scottish biblical scholar, was born in Kirkhill in Aberdeenshire. He was appointed professor of Oriental languages and literature at the New College, Edinburgh, in 1863, and was a member of the Old Testament revision committee, 1870–84. His *Commentary on Job* (1862) was the first attempt in English to analyze an Old Testament text scientifically. Among his other works are *Outlines of Hebrew Accentuation* (1861), *Introductory Hebrew Grammar* (1874), primers on *Job*, *Ezekiel*, and *Hebrews* (1877).

DAVIDSON, JO, 1883–1952, U.S. sculptor, was born in New York City and studied at the Art Students' League there. Much of his time was spent in France and England and, as his ability gradually came to be recognized, he was commissioned to do portrait busts of World War I leaders; these were exhibited in 1920 as "A Plastic History of the War." Thereafter Davidson modeled many persons of prominence. Typical examples of his work are *Woodrow Wilson* and *Anatole France* (in the Luxembourg, Paris); *John D. Rockefeller* (in the Standard Oil Building, New York); and his portrait busts of Gertrude Stein, James Joyce, George Bernard Shaw, Franklin D. Roosevelt, and Ernie Pyle.

DAVIDSON, THOMAS, 1840–1900, U.S. philosopher, was born in Aberdeenshire, Scotland. After 1866 he taught school in Canada, Boston, and St. Louis, and in New York City, where he founded the Breadwinners' College for men and women. In 1883 he founded the Fellowship of the New Life, from which the Fabian Society derived. His works include *The Philosophical System of Antonio Rosmini-Serbati* (1882), *Aristotle and the Ancient Educational Ideals* (1892), and *Rousseau and Education According to Nature* (1898).

DAVIDSON COLLEGE. See Colleges and Universities.

DAVIDSON MOUNTAINS. See Brooks Range.

DAVIES, ARTHUR BOWEN, 1862–1928, U.S. painter, was born in Utica, N.Y. He was called a realist with the temperament of a mystic, and was a master of color tones. His early figure compositions were warmly rich in color. Later the influence of cubism led him to experiment with rhythmic geometric forms. Davies also executed many lithographs, etchings, and tapestry designs. Examples of his work are in the Chicago Art Institute, New York Metropolitan Museum of Art, and the Phillips Memorial Gallery in Washington, D.C.

DAVIES, SAMUEL, 1723–61, colonial American clergyman and educator, was born in New Castle County, Del. Davies went to England in 1753 to raise funds for the College of New Jersey (later Princeton University), founded the first presbytery in Virginia, 1755, and was president of the College of New Jersey, 1759–61.

DAVILA, PEDRARIAS. See Pedrarias Dávila.

DA VINCI. See Leonardo da Vinci.

DAVIS, ALEXANDER JACKSON, 1803–92, U.S. architect, was born in New York City. After 1829, in partnership with Ithiel Town, he designed such buildings as the Indiana State Capitol and the Patent Office, Washington, D.C. Working alone after 1843, he designed the Assembly Hall at the University of North Carolina and buildings for Virginia Military Institute. Davis, ahead of the times, drew plans for a glass and metal building, but they were never used.

DAVIS, BETTE, real name Ruth Elizabeth Davis, 1908– , motion picture actress, was born in Lowell, Mass. Achieving prominence for her portrayal of Mildred in *Of Human Bondage* (1934), she received the Motion Picture Academy Award in 1935 for her work in *Dangerous*, and in 1938 for *Jezebel*. She appeared on the New York stage in *Two's Company* (1952). Among her other films were *Dark Victory*, *The Little Foxes*, *The Corn Is Green*, and *The Virgin Queen*.

DAVIS, CHARLES HAROLD, 1856–1933, U.S. painter, was born in Amesbury, Mass. His pictures include *Evening*, *August*, *The Brook*, *Close of Day*, *Twilight*, *The Deepening Shadows*, and *Time of the Red-winged Blackbird*.

DAVIS, CHARLES HENRY, 1807–77, U.S. naval officer, was born in Boston. During the Civil War he was secretary of the board which planned the blockade of the South Atlantic Coast, and fleet captain in the expedition against Port Royal, 1861. As commander of the Upper Mississippi gunboat flotilla, 1862, Davis repulsed a Confederate attack near Fort Pillow and destroyed the enemy fleet at Memphis. While Chief of the Bureau of Navigations, 1862–65, he was promoted to rear admiral.

DAVIS, DAVID, 1815–86, U.S. jurist, was born in Cecil County, Md. A graduate of Kenyon College, Gambier, Ohio, in 1832 and Yale Law School in 1835, he practiced law in Bloomington, Ill., after 1836. He served in the state legislature and was a circuit judge, 1848–62. He became a close friend of Abraham Lincoln and was a leader of the forces which promoted the nomination of Lincoln in 1860. Appointed to the Supreme Court by Lincoln in 1862, he resigned in 1877. Known as a liberal Republican, he was nominated for the presidency in 1872 by the Labor Reform convention. He served in the U.S. Senate, 1877–83. E. B. Long

DAVIS, DWIGHT FILLEY, 1879–1945, U.S. public official, was born in St. Louis, Mo. He served in World War I, was secretary of war, 1925–29, and governor general of the Philippines, 1929–32. During World War II Davis was director general of the Army Specialist Corps. He was donor of the Davis Cup, the international tennis championship trophy.

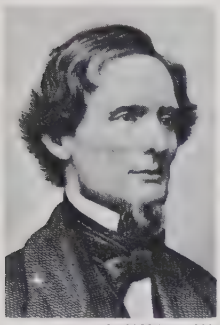
DAVIS, HENRY WINTER, 1817–65, U.S. lawyer and political leader, was born in Annapolis, Md. He graduated from Kenyon College, Gambier, Ohio, in 1837 and studied law at the University of Virginia. He began his law practice in Alexandria, Va., and moved to Baltimore in 1849. A prominent Whig, he was elected to the House of Representatives in 1855 and became a leader of the American, or "Know-Nothing," party. He swung toward the Republican party in 1860 but was influential in backing John Bell on the Constitutional Union ticket. Davis, suddenly finding himself without a party, became a strong Union supporter and was instrumental in keeping Maryland from seceding. Defeated by a Southern sympathizer in the election of 1861, he spoke often for the Union but opposed many of Lincoln's measures. Davis again served in the House, 1863–65, and opposed Lincoln's reconstruction plans. He joined with Sen. Benjamin F. Wade in writing the Wade-Davis bill, which would have given Congress alone the power of reconstructing the South; Lincoln vetoed the measure in 1864. Wade wrote the Wade-Davis manifesto of 1864 attacking the President; however, he later supported Lincoln in the campaign. Although defeated for re-election, Davis remained extremely influential politically and opposed President Johnson's policies. E. B. Long

DAVIS, JAMES JOHN, 1873–1947, U.S. political figure, was born in Tredegar, Wales. He was secretary of labor, 1921–30, and U.S. senator, 1930–45. An active lodge man, he was director general of the Loyal Order of Moose after 1906.

DAVIS, JEFFERSON COLUMBUS, 1828–79, U.S. soldier, was born in Clark County, Ind. He served in the Mexican War, and was a Union captain during the bombardment of Fort Sumter, April 1861, at the start of the Civil War. A brigadier general of volunteers after December 1861, he fought at Pea

Ridge, Ark., the siege of Corinth, Miss., Murfreesboro, Chickamauga, and in the Atlanta campaign. Davis was a capable soldier and later served with the regular army in Alaska and in the Modoc Indian War in California, 1873. E. B. Long

DAVIS, JEFFERSON FINIS, 1808–89, U.S. political figure and president of the Confederate States of America, was born in Christian County (now Todd), Ky., the tenth child of Samuel and Jane (Cook) Davis, a middle-class farm couple of Welsh and Scotch-Irish descent. Davis was born in a four-room log house rather than in the cabin traditionally associated with his birth. He was not related to Abraham Lincoln, despite stories to that effect. Although a Protestant, Davis at the age of seven was sent to the Roman Catholic Seminary of St. Thomas' College in Washington County, Ky. Two years later he was back in Mississippi, where his parents had settled the family on a small plantation near Woodville. There he remained until 1821, when he went to Transylvania University at Lexington, Ky. The influence of his father, a Revolutionary War veteran, grew less and less as the boy became devoted to his older, already successful brother Joseph, who educated him in the ways of the Southern aristocracy. Through the influence of Joseph, young Davis received an appointment to West Point, from which he was graduated in 1828 with an undistinguished record and ranking 23rd in his class of 33. Among his contemporaries at West Point were Robert E. Lee, Albert Sidney Johnston, and Joseph E. Johnston, all three of whom later became Confederate generals. For nearly seven years Davis served at army posts in Wisconsin and Illinois, carrying out several diplomatic missions with Indians and fighting in the Black Hawk War of 1832.



CHICAGO HIST. SOC.
Jefferson Davis

While at Fort Crawford, Prairie du Chien, Wis., Lieutenant Davis fell in love with Sarah Knox Taylor, daughter of Col. Zachary Taylor. Taylor opposed the marriage but Davis resigned from the army on June 30, 1835, to marry Sarah, who died of malaria in Mississippi later that year. For 10 years Davis devoted himself to becoming a slaveholding planter at Brierfield, Miss., near his brother Joseph. He read extensively and it was during this time that his political views were formed. This idyll as country gentleman was interrupted by his marriage in 1845 to Varina Howell, and by his election to the House of Representatives as a states' rights Democrat. He resigned in June 1846 to take part in the Mexican War, commanding the Mississippi Volunteer Rifles regiment at Monterrey and Buena Vista. Serving under Taylor, with whom he had become reconciled, Davis earned a reputation for bravery and military ability that, although deserved, perhaps led to his overvaluing himself as a commander in later years.

Withdrawing from the army again he represented Mississippi in the U.S. Senate from 1847 to 1851; he favored territorial expansion and slavery, but he was willing to accept the Compromise of 1850 limiting the extension of slavery. Unsuccessful as candidate for governor of Mississippi in 1851, he served as secretary of war under Pres. Franklin Pierce from 1853 to 1857 and is credited with having instituted many needed reforms in that office.

From 1857 to January 1861 Davis was again in the Senate. Debating often and ably, he defended slavery, the right of secession, and states' rights, but was not listed with the extremists of the Southern cause. Having threatened secession upon the election of a Republican president, Davis announced the withdrawal of Mississippi from the Union following the victory of Lincoln and resigned from the Senate.

President of the Confederacy. Davis was tired and in ill health. He expected war and hoped to have command of the Southern armies, but was instead elected provisional president of the Confederacy, Feb. 8, 1861, by the convention of seceded states at Montgomery, Ala. Inaugurated February 18, he was confirmed as president by popular vote in November 1861. Confronted by almost insurmountable problems he was much criticized by many in the South during and after the war, but many historians credit him with a great share in welding the Confederacy together for four years and in doing as well as possible under difficult conditions. Davis did interfere a great deal with his military commanders and never learned to delegate authority to his cabinet, with which he had considerable trouble. Despite his Mississippi background he apparently failed to recognize the importance of the western fighting, the region in which he was not blessed with commanders such as Robert E. Lee (whom Davis left largely to his own devices in Virginia). Although he failed to keep the states' rights-conscious Confederate States from dissension among themselves, Davis did much to encourage the people and never publicly despaired of success. He remained persistent in demanding independence for the South. Davis and the government fled from the capital, Richmond, Va., on Apr. 2, 1865, having been notified of the collapse of the city's defenses while at church. He was captured by Union cavalry at Irwinville, Ga., May 10. For two years he was confined at Fortress Monroe, Va., awaiting prosecution on charges of treason. He was never tried, however, and in May 1867 was released on bond furnished in part by bitter enemies of the Confederate cause. Charges against him were dropped in 1869.

Postlude. After a period of travel abroad, Davis headed an insurance company in Memphis, Tenn., which was unsuccessful, as were his other business ventures. He retired in 1879 to his estate, Beauvoir, near Biloxi, Miss., and in 1881 published *The Rise and Fall of the Confederate Government*, a strong defense of the South and his actions. He died in New Orleans and was buried in Richmond.

A man of great courage, endurance, and strong pride, Davis, despite an austere outward appearance, had great warmth of heart and willingly bore the burden of his defeated cause. See Confederate States of America; Civil War, American. E. B. Long

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DAVIS or **DAVYS, JOHN,** 1550?–1605, English navigator and Arctic explorer, was born in Sandridge, Devonshire. He discovered Davis Strait, 1585, and the Falkland Islands, 1592. Sailing with Sir Walter Raleigh, he raided Cádiz, Spain, and the Azores, 1596. Davis was killed in a fight with Japanese pirates off Singapore. He invented Davis' quadrant.

DAVIS, JOHN WILLIAM, 1873–1955, U.S. lawyer, diplomat, and political figure, was born in Clarksburg, W. Va. After serving in Congress, 1911–13, and as U.S. solicitor general, 1913–18, he was ambassador to Great Britain until 1921. A famous counselor, Davis appeared before the U.S. Supreme Court 140 times. In 1924 he was the unsuccessful Democratic candidate for president.

DAVIS, NORMAN HEZEKIAH, 1878–1944, U.S. financier and diplomat, was born in Bedford County, Tenn. He organized and headed the Trust Company of Cuba, 1905–17. During World War I he visited England, France, and Spain as special financial adviser, and became chairman of the finan-

cial section of the Supreme Economic Council of the Allies. Davis was assistant secretary of the treasury, 1919–20, and undersecretary of state 1920–21. He headed delegations to the Geneva Disarmament Conference, 1932, the London Naval Conference, 1935–36, and the International Sugar Conference, 1937.

DAVIS, OWEN, 1874–1956, U.S. playwright, was born in Portland, Me. His first works were melodramas and farces such as *Nellie the Beautiful Cloak Model*, but he later turned to more serious themes. Davis won the 1923 Pulitzer prize for *Icebound*. Among his other works are *The Nervous Wreck* (1923), *The Detour* (1923), *Lazybones* (1924), *Beware of Widows* (1925), adaptations of *The Great Gatsby* (1926) and *The Good Earth* (1932), *Mr. and Mrs. North* (1941), and *No Way Out* (1944). His autobiography, *I'd Like to Do It Again*, appeared in 1931.

DAVIS, RICHARD HARDING, 1864–1916, U.S. journalist and author, was born in Philadelphia, Pa. His achievements as a war correspondent after 1896 became legendary, and his dramatic, colorful reports established a trend in U.S. journalism. Davis' fiction is fast-paced and workmanlike. Among his works are *Gallegher and Other Stories* (1891), *Van Bibber and Others* (1892), *Soldiers of Fortune* (1897), *Ranson's Folly* (1902), *The Bar Sinister* (1903), and *Vera the Medium* (1908). His most successful plays are *The Dictator* (1904) and *Miss Civilization* (1906). Books about his travels and journalistic experiences include *The West from a Car Window* (1892), *Our English Cousins* (1894), *With Both Armies in South Africa* (1900), and *Notes of a War Correspondent* (1910). His mother, Rebecca Harding Davis, 1831–1910, wrote short stories and several novels.

DAVIS, STUART, 1894– , U.S. abstract painter, was born in Philadelphia. He studied in New York with Robert Henri, worked for a time as a cartoonist and magazine illustrator, but soon joined a group of young New York "moderns" in experimental painting. His early work was largely expressionist and semiabstract; after some time spent in Paris, 1928–29, he turned to more radical abstraction and synthetic cubism, often approaching complete nonobjectivity. Davis' work is notable for its pure color and bold, finely balanced design rhythms; even in the nonobjective works a definite American scene feeling is present, as in some of the cityscapes and the witty *Something on the 8-ball*. Davis also painted murals for Rockefeller Center in New York City and at Indiana University.

DAVIS, VARINA HOWELL, 1826–1908, second wife of Jefferson Davis, was born near Natchez, Miss. She married Davis in 1845 and her memoir, *Jefferson Davis, Ex-President of the Confederate States of America* (2 vols. 1890), is a valuable source on his life. Davis dictated to her much of his important *The Rise and Fall of the Confederacy* (1881).

DAVIS, WILLIAM MORRIS, 1850–1934, U.S. geographer and geologist, was born in Philadelphia, Pa., and was graduated from Harvard University, where he taught geology after 1899. Davis headed the American Geographical Society's transcontinental expedition, 1912, and during World War I was chairman of the National Research Council geographic and geologic division. He was founder of the Association of American Geographers, and taught physiographic geography at the California Institute of Technology after 1930.

DAVIS, city, central California, Yolo County, on the Southern Pacific Railroad, 13 miles W of Sacramento. Davis is a railroad junction and residential center in a rich agricultural area. The city contains one of the campuses of the University of California, including the College of Agriculture. Pop. (1955 special census) 6050.

DAVIS AND ELKINS COLLEGE. See Colleges and Universities.

DAVIS DAM. See Colorado River.

DAVIS MOUNTAINS. See Texas.

DAVISSON, CLINTON JOSEPH, 1881– , U.S. physicist, was born in Bloomington, Ill. Known for his research in electricity, magnetism, and radiant energy, Davisson was on the technical staff of the Bell Telephone Laboratories, 1916–46. There, in 1927 in collaboration with L. H. Germer, he discovered the diffraction of electrons by crystals. For this work he shared the 1937 Nobel prize in physics with George P. Thomson.

DAVIS STRAIT, an arm of the North Atlantic Ocean, bounded by Baffin Bay on the N, Greenland on the E, the Atlantic Ocean on the S, and Baffin Island on the W. The strait is about 480 miles long and 280 miles wide. The cold Labrador and West Greenland ocean currents flow through the strait, which is generally navigable from midsummer till late fall. The principal sea lane is located near the Greenland coast. The strait is named for its discoverer, John Davis. See Davis, John.

DAVOS, town, E Switzerland, in the canton of Grisons, on the Landwasser River, 73 miles SE of Zurich. Davos is a noted vacation and health resort located at an elevation of about 5000 feet in the Davos Valley of the Rhaetian Alps. The town consists of two sections, Davos Dorf and Davos Platz. Davos contains numerous hotels and tuberculosis sanatoria. The town has a sixteenth century town hall. Davos is the setting for Thomas Mann's *Magic Mountain*. Pop. (1950) 10,433.

DAVOUT, LOUIS NICOLAS, 1770–1823, marshal of France, was born at Annoux and was trained at military schools. He made a reputation for himself in the early days of the French Revolution, rising rapidly to the rank of general in the revolutionary army. He later fought under Napoleon, who made him a marshal in 1804. Davout was a strict disciplinarian, exacting rigid obedience of his troops; in the Grande Armée it was always his Third Corps which undertook the most difficult assignments. After his brilliant victory over the Prussians at Auerstädt Davout was created Duc d'Auerstädt by Napoleon; another victorious campaign brought him the title of Prince d'Eckmühl in 1809. Davout's loyalty to Napoleon was unswerving; during the Russian campaign and after that disaster, he continued to fight until the emperor's abdication. Following Napoleon's escape from Elba, Davout gathered troops and supplies for a new campaign and acted as minister of war during the Hundred Days. He directed the brave but hopeless defense of Paris following the defeat at Waterloo. After the Bourbon restoration Davout was deprived of his titles and decorations, but eventually returned to favor and in 1819 became a peer of France. See Napoleon.

DAVY, SIR HUMPHRY, 1778–1829, English chemist, was born in Penzance, where he served as an apprentice to an apothecary and later as assistant to a physician. Experiments that he made during this time led to his appointment in 1798 as superintendent of the Medical Pneumatic Institution, founded at Bristol by Dr. Thomas Beddoes. While there Davy discovered the anesthetic properties of "laughing" gas (nitrous oxide) and proposed that it be used in dentistry—a suggestion that was not taken up until nearly 50 years later. In 1802 he became professor of chemistry at the Royal Institution of London, where for the ensuing 10 years he conducted research in agricultural chemistry and electrochemistry. In 1807 he produced the elements potassium and sodium by electrolysis of potash and sodium chloride; and in 1810 he determined that oxymuriatic acid, discovered in 1774 by Scheele, was in reality a simple element which he named chlorine. In 1815 Davy invented the miners' safety lamp which bears his name, and which he refused to patent, making it available to any one who wished to use it. Davy was also a fine poet and a brilliant lecturer. His lecture *On Some Chemical Agencies of Electricity*, a milestone in chemical science, was

published in 1806. He was knighted in 1812, made a baronet in 1818, and was elected president of the Royal Society in 1820.

DAVY JONES, in nautical folklore, the spirit or personification of the sea. "Davy Jones' Locker" designates the bottom of the sea.

DAVY LAMP. See SAFETY LAMP.

DAWES, CHARLES GATES, 1856–1951, U.S. lawyer, financier, diplomat, and thirtieth vice-president of the United States, was born in Marietta, Ohio. He was the son of Rufus R. Dawes, a Civil War general, and a descendant of William Dawes, who rode with Paul Revere. In 1896 he managed the Illinois campaign of William H. McKinley.

Dawes, who was U.S. comptroller of the currency, 1897–1901, organized the Central Union Trust Company in Chicago, which he headed after 1902, and formed the City National Bank and Trust Company, of which he was chairman after 1932. During World War I with the rank of brigadier general, Dawes was chief purchasing agent for the American Expeditionary Force. In 1921 he organized the U.S. Bureau of the Budget and was its director. While heading the International Commission on Reparations, 1923, he achieved international prominence for the Dawes Plan, by which Germany's war reparations payments were eased, 1924. Dawes was vice-president of the United States, 1925–29, and ambassador to Great Britain, 1929–32. He contributed color to the formal routine of public office with his unique profanity ("Hell 'n Maria" was his favorite expletive) and his disregard for protocol. As ambassador he refused to wear the customary knee breeches for court dress but chose instead to appear in ordinary evening dress and smoke his famous underslung pipe. Dawes was president of the Reconstruction Finance Corporation established in 1932. In 1925 he shared the Nobel peace prize with Sir Austen Chamberlain. He wrote *The Banking System of the United States* (1894), *Essays and Speeches* (1915), *A Journal of the Great War* (1922), and *The First Year of the Budget of the United States* (1923).

DAWES, HENRY LAURENS, 1816–1903, U.S. legislator, was born in Cummington, Mass. As a U.S. Senator after 1875 he was chairman of the committee on Indian Affairs and effected the passage of legislation in the interests of the Indians, especially the Dawes Act of 1887, which gave citizenship and homesteads to Indians.

DAWES, WILLIAM, 1745–99, American patriot, was born in Boston. He rode with Paul Revere and Samuel Prescott to warn the patriots that British troops were on the march, Apr. 18, 1775. Dawes, taking the Brighton road, met Revere in Lexington. Revere was captured, but either Dawes or Samuel Prescott (it is not known which) continued to Concord.

DAWKINS, SIR WILLIAM BOYD, 1837–1929, British geologist, was born in Wales. As a member of the Geological Survey of Great Britain after 1861 he spent eight years mapping the Thames Valley and sections of Kent. Later he acted as consulting geologist on water supply and mining projects and served as a member of the Channel Tunnel Commission in 1882. He described the results of his research on fossil mammals and early man in *British Pleistocene Mammalia* (1866–87), *Cave Hunting* (1874), and *Early Man in Britain and His Place in the Tertiary Period* (1880).

DAWN, the diffused illumination present just before sunrise which is the reflection of sunlight from upper atmospheric strata. See TWILIGHT.

DAWSON, GEORGE MERCER, 1849–1901, Canadian geologist, son of Sir John William Dawson, was born in Pictou, N.S. He was geologist and naturalist to the North American Boundary Commission, 1873–75, and after 1895 was director of the Geological Survey of Canada. He wrote *Descriptive Sketch of the Physical Geography and Geology of Canada* (1884) and *The Physical and Geological Features of the Rocky Mountains* (1885).

DAWSON, SIR JOHN WILLIAM, 1820–99, Canadian geologist and educator, was born in Pictou, N.S., and studied at the University of Edinburgh. He made geological researches in Nova Scotia, 1850, and was professor of natural history and later vice-chancellor of McGill University, Montreal, 1855–93. Instrumental in founding the Royal Society of Canada, he served as its first president. Dawson was also president of the American Association for the Advancement of Science, 1882, and of the Geological Society of America, 1893. He was a pioneer in paleobotany, and his *Devonian and Carboniferous Flora of Eastern North America* records the discovery of the Eozoon Canadense of the Laurentian limestone (see EOZOON). Among his writings are *Story of The Dawn of Life* (1875), *The Origin of the World* (1877), and *Modern Ideas of Evolution* (1890).

DAWSON, WILLIAM LEVI, 1886– , U.S. political figure, was born in Albany, Ga. Some years after being admitted to the Illinois bar in 1920, Dawson entered politics and rose to power in the Chicago Democratic organization. He was elected alderman in 1933 as a Republican, and later became a Democrat and vice-chairman of the Democratic national committee. A congressman after 1942, he was chairman of the government operations committee after 1949, the first Negro ever to become chairman of a congressional committee. With Rep. Adam Clayton Powell of New York, he helped lead a movement for legislation to guarantee equality of opportunity for Negroes.

DAWSON, city, SW Georgia, county seat of Terrell County, on the Central of Georgia and the Seaboard Air Line railroads, on U.S. Highway 82; 57 miles SE of Columbus. Dawson is a market center for the peanut, cotton, and corn crops of the surrounding farming area. Pop. (1950) 4411.

DAWSON, city, NW Canada, in the Yukon Territory, at the confluence of the Klondike and the Yukon rivers; 255 miles ESE of Fairbanks, Alaska. Dawson is an airline stop, is joined by local roads with the Alaska Highway, and from June to October is connected by steamer with Whitehorse. Founded during the rush to the Klondike gold fields, it was named for Dr. G. M. Dawson, an early explorer. Just southeast of the city is Bonanza Creek, site of the first large-scale gold strike in the Yukon in 1896. Dawson is a distributing center for the Klondike gold and coal mining region. Vegetables and grains are grown near the city. Pop. (1951) 783. See KLONDIKE.

DAWSON CREEK, village, W Canada, in the province of British Columbia, on Dawson Creek, the Northern Alberta Railway, and the Alaska Highway; 310 miles NW of Edmonton, Alberta. Situated in a cattle and grain region, Dawson Creek has grain elevators and meat packing and lumbering industries. Pop. (1951) 3589.

DAX, ancient Aquae Tarbellicae, town, SW France, in the department of Landes, on the Adour River; 130 miles SSW of Bordeaux. Dax is a famed resort center, noted especially for its hot sulfur springs and mud baths. Across the Adour River is St.-Paul-lès-Dax, which has a fifteenth century church with a Romanesque apse. Pop. (1954) 14,557.

DAY, BENJAMIN, 1838–1916, U.S. printer, was born in New York City, the son of Benjamin Henry Day. He invented a process for shading the plates used in printing maps and illustrations, which became known as the Ben Day or Benday process.

DAY, BENJAMIN HENRY, 1810–89, U.S. printer and journalist, was born in West Springfield, Mass. Backed by experience gained as a printer, Day launched the *New York Sun* as a penny paper in 1833. He was the first to employ newsboys to sell papers and to apply steam power to a printing press in America, 1835. After selling the *Sun* in 1838 for $40,000, he founded *Brother Jonathan* (1842), a monthly which reprinted novels and later became the first American illustrated weekly.

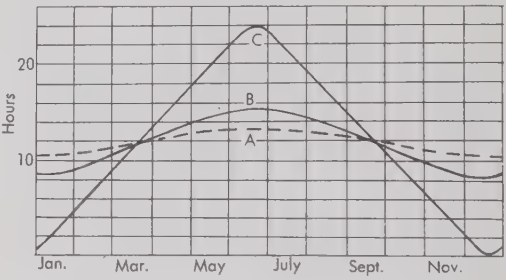
DAY, CLARENCE SHEPARD, 1874–1935, U.S. author, was born in New York City. After graduating from Yale University, he was employed for a time in his father's brokerage firm. In 1898, crippled by arthritis, he retired from business and devoted himself to writing and illustrating. In his first notable work, *This Simian World* (1920), a satire, he suggested that the human race had evolved in the wrong direction. This was followed by humorous but sympathetic portraits of his parents—*Life with Father* (1935), *Life with Mother* (1937), and others. *Life with Father* was popular as a play (by Howard Lindsay and Russel Crouse, 1939) and later was adapted for motion pictures and television.

DAY or **DAYE, STEPHEN,** 1594?–1668, first printer in the English colonies in America, was born in England. About 1638 he sailed for New England to establish a print shop for the Rev. Jesse (Josse or José) Glover in Cambridge, Mass. Glover died at sea but Day, financed by Glover's widow, went ahead with the plan. His first work was a single-sheet printing of the *Freeman's Oath*, issued in January 1639, followed in the same year by an *Almanack*. In 1640 Day printed the first book in English in America, *The Whole Book of Psalmes, faithfully translated into English Metre*. The General Court of Cambridge awarded him 300 acres of land in 1641 as "the first that sett upon printing." Although Day's name does not appear on any of the printing attributed to him, it is known that 22 imprints were made by the Cambridge Press before Samuel Green became the printer in 1649.

DAY, WILLIAM RUFUS, 1849–1923, U.S. public official, was born in Ravenna, Ohio. He was secretary of state during the Spanish-American War, 1898, and helped bring about the neutrality of France and Germany. As chairman of the commission to arrange peace with Spain, 1898–99, he proposed purchase of the Philippine Islands instead of their acquisition by right of conquest; in the treaty the sum of $20 million was specified as payment for the islands. Day was associate justice of the U.S. Supreme Court, 1903–22.

DAY, the interval of time required for the earth to complete one rotation on its axis. The time for one rotation is dependent upon the celestial reference points used for its determination. For example, the length of the astronomical, or sidereal, day is the interval between consecutive occasions when the vernal equinox (see EQUINOX) is on the meridian (see MERIDIAN, CELESTIAL). The apparent solar day, on the other hand, is the interval between the consecutive lower transits of the sun across the observer's meridian. Since the sun is a little farther east among the stars at a stated time each day than it was at the same time the day before, the earth has to rotate through a slightly greater angle to "catch up" to the sun. Therefore the solar day is about four minutes longer than the sidereal day. The length of the true solar day is constantly varying because the earth's motion in its elliptical orbit is not uniform. (See ORBIT; PERIHELION; APHELION.) Since the earth travels farther in a day when it is nearer the sun, the length of the true solar day also depends upon the distance between the earth and the sun.

Mean Solar Day. To aid in the development of mechanical clocks a better timekeeper than the real sun has been devised. This timekeeper is a fictitious body known as the mean sun and is assumed to move uniformly along the celestial equator so as to complete its annual circuit in the same time the true sun takes for its circuit of the ecliptic (see ECLIPTIC). The interval of time required for the mean sun to pass over the local meridian twice is called the mean solar day, or civil day. The mean solar day begins and ends at midnight, and is divided into 24 mean solar hours. Each mean solar hour is subdivided further into mean solar minutes and seconds. Hours of the civil day are counted in two divisions, each containing 12 hours, although for many military and scientific purposes it is customary to divide the civil day into 24 hours. See TIME, MEASUREMENT OF, *The Local Mean Time*.



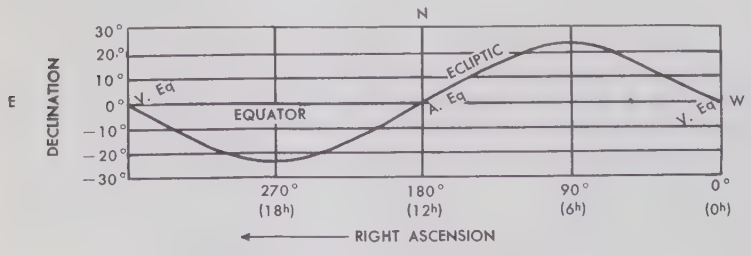
Number of Hours a Day Sun Is Above Horizon in the North Latitudes. *A* represents 22° 30′; *B*, 45°; and *C*, 67° 30′.

The length of the mean solar day in sidereal time units is $24^h\ 3^m\ 57^s$. The length of the sidereal day in mean solar units is $23^h\ 56^m\ 4^s$. The duration of daylight, that is, the interval between sunrise and sunset, varies with the altitude and with the season of the year (see SEASON); times of sunrise and sunset are tabulated in the *American Ephemeris and Nautical Almanac*.

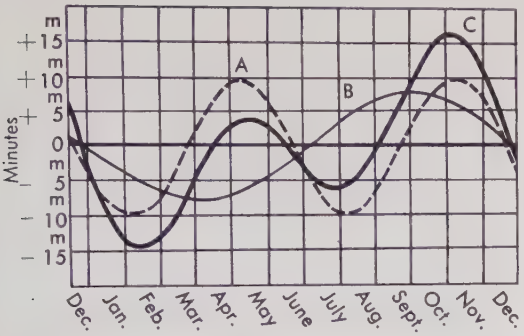
The Julian Day is the number of days that have elapsed since noon on Jan. 1, 4713 B.C., the adopted zero-day. For example, the United States entered World War II Dec. 8, 1941, or on the Julian date of 2,429,972. See CALENDAR, *The Julian Calendar*.

Equation of Time. The difference between the apparent time and mean time is called the equation of time. The two times coincide during four days of the year, but during the other days of the year the apparent time is either faster or slower than the mean time. In November a sundial, which measures apparent time, is a quarter of an hour ahead of the mean, or local, civil time. A table of values of the equation of time is given in the *Ephemeris* for every day of the year. See TIME.

Legal Day, generally indicates the time elapsing from one midnight to the next, but it is commonly used in commercial law to denote that part of the day in which business is usually transacted. Fractions of a day are generally disregarded; for example, a day is considered a point of time and two judgments entered on the same day have equal priority regardless of the hour entered. However, "when substantial justice requires it" or when statutes (such as recording acts) so provide, fractions are considered in determining precedence. In computation of time from the day an act was done or is to be done there is no universally accepted rule as to what day the counting should start or conclude. The most common



Relation Between Ecliptic and Equator During a Solar Year



Equation of time—apparent minus mean solar time—shown in curve C, is the result of two causes. Curve A shows effect caused by angle between the equator and the ecliptic, curve B that caused by nonuniform motion of sun along the ecliptic because of the eccentricity of the earth's orbit.

rule excludes the first day and includes the last. Thus if an act is to be performed a certain number of days after a named date the count commences with the day following that date. *Lawful day* is a day on which judicial business can be competently transacted. The opposite is *dies non juridicus*, or *dies non*, and includes Sundays and certain holidays. See Days of Grace.

DAY AND NIGHT BREEZES, a daily variation in the direction and velocity of the wind produced by changes in the surface temperature of the earth. These variations are small over the ocean and other large expanses of water but are very noticeable over land, being distinctly stronger near noon than at night. This phenomenon is due to the convectional interchange of air masses between the earth's surface and the more rapid upper currents. As the ground cools toward evening the tendency for air to ascend ceases and the surface wind weakens and calms. Along the coasts bordering large masses of water there are breezes that travel landward in the daytime and from land to water in the evening; this daily change in direction is caused by the difference in cooling and heating rates of the land and water. During the day the land heats rapidly and the air over the land becomes warmer and less dense, and begins to rise. The cooler, denser air over the water travels toward the rising air over the land. In the evening the situation is reversed; the cooler, denser air over the land travels toward the warmer, less dense air over the water. See Convection; Meteorology.

DAYDREAMING is wishful or seemingly purposeless thinking or reverie during waking hours. It is particularly associated with adolescence, the first part of which is characterized by a dreamy attitude toward life. In daydreams a young person sometimes, in imagination, attains a wished-for goal, or fulfills an ambition that in reality could be realized only by an adult. Daydreams may consist of fanciful imagery, or of imaginary adventures. Such fantasies are symptomatic of the adolescent's lack of maturity and the problems he faces in learning to accept the realities and the responsibilities of the adult world he is entering.

Psychologists hold that parents need have no concern if a young person's daydreaming is not excessive, and some child guidance experts recommend that the adolescent should not be kept so busy by responsibilities and amusements as to deprive him of all time to daydream in making the transition from childhood to maturity. Normally, daydreaming tendencies pass with the closing years of adolescence.

In adults, daydreaming is regarded as an escape or safety-valve mechanism, and sometimes may be the best immediate solution for some difficult or unbearable situation. Habitually employed as a refuge from reality, however, daydreaming may be a symptom of the individual's gradual withdrawal from the world around him, and indicate some underlying problem or disorder. See Autism; Imagination; Adolescence.

DAY-LEWIS, CECIL, 1904– , British poet, novelist, and critic, was born in Ballintogher, Ireland. With W. H. Auden and Stephen Spender, Day-Lewis was an exponent of the poetic-political school in England during the 1930s. He wrote *Child of Misfortune* (1939) and (under the pen name of Nicholas Blake) several detective stories. His volumes of verse include *The Magnetic Mountain* (1933) and *Word Over All* (1943). He became a professor of poetry at Oxford University in 1951.

DAYLIGHT SAVING is the practice of setting the clock one hour ahead of standard time during the spring and summer months to make greater use of natural light. A scheme to put the clock ahead 80 minutes in the spring and summer was launched in Great Britain in 1907 by William Willet, whose persistent advocacy created widespread interest, although his plan was not adopted. During World War I, in the spring of 1916, Great Britain and nearly all European countries adopted daylight saving and set clocks ahead one hour, to get workers to the factories earlier during the season of longest daylight and to conserve fuel for lighting and heating. Some nations retained the plan after the war, and the practice was widely revived during World War II.

New York City adopted daylight saving in the spring of 1916, and after U.S. entry into the war in 1917 there began a movement for national daylight saving. In March 1918 Congress passed an act providing that throughout the country standard time should be advanced one hour on the last Sunday in March and returned to normal standard time on the last Sunday in October. In 1919 rural pressure succeeded in getting Congress to repeal the daylight saving law over President Wilson's veto. Many urban communities, however, adopted daylight saving time, sometimes known locally as summer time or fast time, for the spring and summer months.

Soon after entry into World War II the United States adopted "war time" (one hour ahead of standard time the year around), effective Feb. 9, 1942, and ending Sept. 30, 1945. Most other countries also returned to standard time, although many continued to observe daylight saving in the summer months. About half of the states in the United States continue to observe daylight saving time, at least in part, usually from 2 A.M. the last Sunday in April to 2 A.M. the last Sunday in September. Daylight saving generally has been favored by city people because it affords long spring and summer evenings for recreation, and opposed by farmers because of its interference with milking schedules and other work. See Time, Measurement of.

DAY LILY, any one of several yellow-flowered, perennial, herbaceous plants of the lily family, *Liliaceae*. There are about six species of day lilies, genus *Hemerocalis*, native from Europe to Japan. Several species are cultivated in flower gardens in the United States. One of these naturalized day lilies is the lemon, or tall yellow, day lily, *H. flava*, a native of Asia that often reaches a height of 3 feet. *H. fulva*, the tawny day lily, is also a native of Asia and grows to a height of 6 feet. Day lilies with blue or white flowers comprise the genus *Hosta*. They are planted for their attractive, often variegated foliage.

DAY NURSERY is an institution for the care of young children whose mothers are employed or who for reasons such as illness are unable to care for them during the day. The nursery school offers a prekindergarten program for half days only (see Nursery School). During the nineteenth century many day nurseries, or *crèches*, were established in France and Belgium. The first day nursery in the United States was established in New York in 1854, but the nursery movement in the United States and in England actually began in the late 1890s.

COMMUNITY FUND OF CHICAGO

A Salvation Army settlement day nursery provides day care and furnishes nourishing meals for preschool-age children who cannot be supervised in their homes during the day.

Many day nurseries are operated commercially as profit-making business ventures; others, maintained by child welfare or other community organizations, generally charge nominal fees according to ability to pay and services rendered. The nursery provides food, recreation, rest, preschool educational activities, and some health services. Some community-sponsored and financed nurseries provide for case social services, thus ensuring closer co-operation among the nursery, other welfare agencies, and the home. The extensive employment of women during and after World War II greatly increased the need for day nursery services. See CHILD WELFARE, Child Welfare Services, *Foster Homes and Institutional Care.*

DAY OF ATONEMENT. See ATONEMENT, DAY OF.

DAYS OF GRACE are the extra days, usually three, allowed to a person liable under a bill of exchange or promissory note in which to make payment. They are so called because originally they were given as *of grace*, rather than *as right*, but this custom of merchants early developed into law. Bills payable *at sight* or *on demand* are not generally entitled to days of grace, though some state statutes have provided otherwise. Bank checks never have this privilege; if the last day of grace falls on a Sunday or public holiday, payment must be made on the preceding day.

DAYTON, city, N central Kentucky, in Campbell County, on the Ohio River, on the Chesapeake and Ohio Railroad, opposite Cincinnati, Ohio, a part of the metropolitan area of Cincinnati. The principal manufactures are watch cases, compacts, cigarette cases, paint, and varnish. Pop. (1950) 8977.

DAYTON, city, SW Ohio, county seat of Montgomery County; at the confluence of the Stillwater and Mad rivers with the Miami River; on the Baltimore and Ohio, the Erie, the New York Central, and the Pennsylvania railroads, and U.S. highways 25 and 35; a scheduled airline stop; 48 miles NNE of Cincinnati. Dayton covers an area of about 25 square miles. The city's streets are broad and symmetrically planned, and are interspersed with about 20 parks comprising more than a thousand acres of land. Dayton has been called the "birthplace of aviation" because the early experiments of the Wright brothers were made here; it is still a center of aeronautical research. Nearby is Wright-Patterson Air Force Base.

Aerial view of Dayton, Ohio, shows neat appearance, wide streets, and smog-free air that have combined to make it one of the nation's loveliest medium-sized cities.

OHIO DEVELOPMENT AND PUBLICITY COMM.

The proximity of the coal and natural gas fields of Kentucky and West Virginia helped to make Dayton an industrial city. In 1955 there were about 700 manufacturing firms in the Dayton metropolitan area. The principal manufactured products include business machines, airplane and automobile parts, electric lighting equipment and motors, sports equipment, refrigerators and other household appliances, rubber goods, and precision tools. Printing and publishing is an important industry.

Dayton is the site of the University of Dayton, founded in 1850; United Theological Seminary, 1871; and the Dayton Art Institute, 1919. Other points of interest include Newcomb Tavern (1796), the Paul Lawrence Dunbar Museum, and a veterans' hospital. Near the city are Mound Laboratory, an atomic research center, and the Dayton flood-control dams.

Dayton was first settled in 1796 and incorporated in 1805. It was named in honor of Gen. Jonathan Dayton, a delegate to the Constitutional Convention. The settlement grew with the development of canals in the 1830s and the railroads in the 1850s, and during the Civil War the manufacture of railway cars and farm implements expanded rapidly. In 1879 the first cash register was manufactured in Dayton, and in 1902 two bicycle makers, Orville and Wilbur Wright, built their first airplane. A long history of floods was culminated by the disastrous one in March 1913, when there was extensive property damage and loss of life; this gave rise to the formation of the Miami Conservancy District in 1915. The calamity also demonstrated the inability of the existing form of government to cope with the situation, and Dayton became, in 1914, the first large city to adopt a commission-manager form of government. (See CITY GOVERNMENT, *City-Manager or Council-Manager Plan.* Pop. (1950) 243,872.

DAYTON, city, SE Tennessee, county seat of Rhea County; on the Southern Railroad, and U.S. Highway 27; near the Tennessee River; 35 miles NNE of Chattanooga. The city was founded in about 1884. Baskets, hosiery, and underwear are manufactured here. Dayton is the site of William Jennings Bryan University, founded in 1930. The famous Scopes trial was held here (see SCOPES TRIAL). Pop. (1950) 3191.

DAYTON, UNIVERSITY OF. See COLLEGES AND UNIVERSITIES.

DAYTONA BEACH, city, NE Florida, in Volusia County, where the Halifax River enters the Atlantic Ocean; on the Florida East Coast Railroad, and U.S. highways 1 and 92; a scheduled airline stop; it is 85 miles SSE of Jacksonville. The town was founded by Mathias Day in 1870. The present city is the result of the consolidation of the towns of Daytona, Daytona Beach, and Seabreeze in 1926. It is the site of Bethune-Cookman College, founded in 1872. Daytona Beach has a boatworks and is a popular year-round resort. Its white sand beach, 23 miles long and 500 feet wide at low tide, also serves as an automobile racecourse. Pop. (1950) 30,187.

DDT is a synthetic insecticide produced by reacting chloral with chlorobenzene in the presence of sulfuric acid. During its first few years DDT (abbreviation of the chemical name dichloro-diphenyl-trichloroethane) proved its value in killing many insects that carry disease or destroy crops. Its performance in controlling mosquitoes, body lice, and

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Low-flying planes demonstrate DDT spraying at an airport in Washington, D.C. The insecticide has been used with considerable success against both crop and household pests.

other disease-carrying insects was largely responsible for the low incidence of malaria, typhus, and other insect-borne diseases among U.S. troops during World War II.

History. DDT was first reported in 1874 by Othmar Zeidler at the University of Strasbourg, Germany. Its insecticidal properties were not discovered until 1939 when Paul Müller, a Swiss chemist, while searching for a new mothproofing agent found that DDT was effective in killing a large variety of insects. In the summer of 1942 preparations containing DDT were introduced to the United States.

Properties. DDT is a nearly white, crystalline substance melting at 108.5 to 109°C. It is insoluble in water but dissolves in benzene, kerosene, and various other organic solvents. Technical grade DDT contains about 10 per cent impurities and about 20 per cent of an inactive type of DDT known as *o, p'* DDT. In pure or technical form DDT is not a practical insecticide. It must be properly formulated with a suitable solvent, or emulsified in water. DDT may be ground with inert ingredients to form dusting powders, or made into suspensions by adding to these powders suitable wetting agents. Solutions of DDT are frequently dispersed by a liquid gas propellant, as in an aerosol bomb.

Both a contact and internal poison, DDT kills insects and other organisms by simple contact or by ingestion of surfaces treated with the poison. An insect exposed to DDT exhibits nervousness, loses control of its limbs, and staggers about helplessly. Death may not occur for several hours or even days. A relatively stable compound, DDT is particularly noted for its prolonged residual action, killing not only the insects present at the time of application, but also those that come to rest on a treated surface weeks or even months later. Exposure of treated surfaces to weathering conditions such as sunlight, heat, and rain greatly reduces its period of effectiveness. DDT alone, however is not an insect repellent.

Uses and Precautions. DDT is an effective weapon for use against such disease carriers as houseflies, body lice, and mosquitoes, and against such annoying pests as bedbugs and cockroaches. Livestock can be given protection against horn flies by spraying with a water emulsion containing .3 per cent DDT. For control of such major crop pests as the codling moth, Japanese beetle, oriental fruit moth, and certain forest defoliators its effectiveness is outstanding. Among insects that show a remarkable immunity to DDT are such major crop pests as the cotton boll weevil, cotton leaf worm, Mexican bean beetle, two-spot spider mites, and many aphids. Although DDT has a rather wide margin of safety when used on plants, its insecticides do have harmful effects on young tomato plants and on crops belonging to the squash, cucumber, and melon family, *Cucurbitaceae;* however, a special aerosol grade of DDT has been developed that produces no injury to these plants.

Proper timing of applications will alleviate to a great extent the destruction of such beneficial insects as bees and other insect pollinators. Early instances of serious effects of DDT on fishes, birds, and other forms of wildlife have largely been rectified through properly timed applications and the use of relatively low dosages. Fish are more susceptible to DDT poisoning than are birds or mammals; hence it is recommended that applications over water surfaces not exceed one pound per acre.

Unless administered with care, DDT may also be harmful to humans. The high residual property of DDT makes decontamination of treated edible products difficult. Since DDT tends to accumulate in fat, it can be found in the fat globules of milk. Its promiscuous use around cows thus constitutes a threat to young children whose diet includes a large proportion of milk. The usual symptoms of DDT poisoning are acute abdominal pain and vomiting, followed by dizziness and weakness. Tests have shown that dangerous amounts of DDT are not absorbed through the skin of man or other warm-blooded animals, with the exception of some oil emulsions that can penetrate.

There is some evidence to indicate that insects such as the housefly develop an immunity to DDT. The exact physiological process is not known, but experiments have shown that the fly is capable of converting DDT into a harmless compound through an enzyme mechanism. Consequently a great amount of chemical research has been carried on to develop other synthetic insecticides that equal or surpass the success of DDT. See Insecticide.

DEACON, a minister or officer in some Christian churches. The office began in the Jerusalem church when seven men were set apart to administer charitable relief (Acts 6: 1–6). These deacons, however, did not limit their work to waiting on tables; Stephen engaged in preaching and became the first martyr (Acts 7), while Philip administered baptism (Acts 8: 26–39). Other references to deacons in the Bible (Phil. 1: 1; I Tim. 3: 8) and in early Christian writings show that the deacon was a subordinate minister who assisted the priest. In the Roman Catholic and Orthodox churches the deacon ranks below the bishop and priest. In the Roman Catholic, Anglican, Episcopal, and Methodist churches the diaconate is usually a state of probation for the priest or minister. In the Lutheran church the deacon is a minister who acts as assistant in a parish; in the Presbyterian, Baptist, and some other Protestant churches he is a layman who helps manage church affairs.

DEACONESS, in certain denominations a woman whose life is devoted to church work. In Rom. 16: 1, Paul commends Phebe as "a servant (*diakonon*) of the church which is at Cenchrea." According to the *Apostolic Constitutions* of the third century the deaconesses were a recognized order of female ministers; they worked with the deacons, showed the women their places in the church assemblies, assisted at the baptism of women, and arranged the agape or love feast. At first consecrated to their religious offices by ordination, later they were inducted into office by prayer without the imposition of hands. The Roman Catholic church discontinued the office in the twelfth century. During the nineteenth century the office was revived by the German Lutherans and by the Church of England, and in the United States by the Episcopal and Methodist churches. Among modern churches of these denominations, deaconesses devote their time chiefly to the care of the sick and poor, to instruction, and to parish visitation.

DEAD CENTER, in mechanics, is either of the two positions of a crank and connecting rod when crank and rod are in the same straight line. Because a crank has no turning effect at dead center, many machines have several cranks set at angles to each other. Others use the momentum of a flywheel to turn the crank past dead center. See Crank.

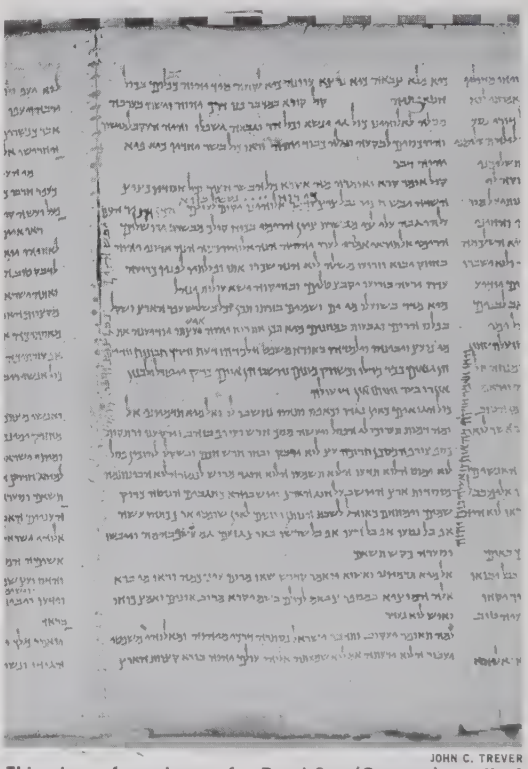
DEADLY NIGHTSHADE. See Belladonna.

DEAD SEA, Arabic Bahret Lut or Birket Lut, Hebrew Yam ham Melah, saline lake, E Israel and W Jordan, in the Great Rift Valley (see GREAT RIFT VALLEY). The Dead Sea is roughly oval in shape except for a promontory on its southeastern shore. It is nearly 50 miles long from north to south and varies in width from 3 to 10 miles. The total area is 405 square miles and the elevation is 1292 feet below sea level. Adjacent to the Dead Sea is the lowest land on the earth's surface.

The waters of the Dead Sea are deepest (up to 1300 feet) in the north; the southern part is generally shallow. Bordering the lake on the east and west are barren, rugged uplands. In places cliffs up to 2000 feet high rise abruptly from the lake shores. Extensive saline mud flats border the northern and southern ends of the Dead Sea. The sea is fed by great numbers of short streams, most of them temporary, but principally by the Jordan River from the north. There is no outlet from the lake, excess water being carried away by evaporation and seepage. The evaporation rate is high in the surrounding region and only a few inches of rain fall on the Dead Sea in an average year. The water of the lake is more than 25 per cent saline, or approximately five or six times the concentration existing in ocean water. The high specific gravity of the Dead Sea water permits the human body to float easily on the surface but the salinity is so great that no life can exist in the lake. The Dead Sea, which contains great quantities of sodium, magnesium, potassium, and calcium salts, supports a chemical extracting industry centered at Sodom, Israel. Engedi, on the Israeli western shore, is a vacation resort. The famous Dead Sea Scrolls were discovered in 1947 at Khirbet Qumran, on the northwestern shore of the lake. See DEAD SEA SCROLLS; PALESTINE.

DEAD SEA SCROLLS, documents of biblical times discovered in caves near the Dead Sea in Palestine. The first scrolls were found by Arabs in 1947 in a cave near Khirbet Qumran, a few miles southeast of Jericho. Cave 1 produced seven more or less complete manuscripts, including one of the Book of Isaiah, and fragments of scores of others. Later explorations turned up manuscripts in other caves, the largest collection coming from Cave 4. Tens of thousands of fragments were found. Khirbet Qumran was the community center of the Essenes, a sectarian Jewish group described in detail by the Jewish historian Josephus. The Essenes lived at Qumran from shortly before 100 B.C. until A.D. 69, when the Romans destroyed the community. See ESSENES.

More than 400 manuscripts have been identified. About one-third are biblical documents, representing all Old Testament books except possibly Esther. The others fall roughly into three categories: (1) manuals regulating Essene organization and ritual; (2) commentaries on Old Testament books; (3) hymns and songs, possibly composed by the community's founder and law giver, "The Righteous Teacher." This leader was persecuted and possibly martyred by "The Wicked Priest." The Essenes lived a pious, ascetic, communal life, regarding themselves as the people of the New Covenant. They engaged in repeated baptisms, participated in a sacred common meal, or anticipatory "messianic banquet," and lived in imminent expectation of the coming of two Messiahs and of the consummation of the age in a final victory of God.



JOHN C. TREVER

This view of a column of a Dead Sea (Qumran) scroll of Isaiah A, dating from about 100 B.C., contains insertions in three hands to indicate corrections covering 50 years.

The significance of the scrolls may be the following: (1) since these manuscripts are some thousand years older than previous biblical documents an earlier form of the Old Testament may be recovered; (2) the documents provide information on Judaism at the beginning of the Christian Era; (3) the scrolls throw new light on Christian beginnings and on New Testament interpretation. There are many parallels between the Essenes and the early Christians, but their differences are more profound. There is a marked contrast between Jesus and the Essene leader; the former came eating and drinking and was the friend of publicans and sinners, while the latter was a super-righteous teacher who withdrew from sinful humanity. The new scrolls support the conclusion that the New Testament represents a radical departure from Judaism. DAVID NOEL FREEDMAN

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Situated 1292 feet below sea level, the Dead Sea is the world's lowest body of water. Because of the high salt content, swimmers float readily on the water's surface.

PAUL'S PHOTOS

DEADWOOD, city, W South Dakota, county seat of Lawrence County; on the North Western and the Burlington railroads and U.S. Highway 85; in the N Black Hills, 35 miles NW of Rapid City. Deadwood is located in a resort area at an elevation of 4545

feet. The city was established after the discovery of gold here in 1875, and during the next year about 25,000 people crowded into Deadwood. "Wild Bill" Hickok, Henry W. "Preacher" Smith, "Calamity Jane," and "Deadwood Dick" Clarke were early residents. Although its prosperity fluctuated, the town became more stable with the development of the nearby Homestake properties. The town was nearly destroyed by fire in 1879, but it was quickly rebuilt. Lumber, creosoted wood products, and jewelry are manufactured and gold is mined nearby. The annual "Days of '76" celebration commemorates Deadwood's early history. (See also LEAD (city); HICKOK, JAMES BUTLER.) Pop. (1950) 3288.

DEADWOOD DICK, sobriquet of Richard W. Clarke, 1845–1930, U.S. frontiersman, born in England. His exploits as an Indian fighter in the Sioux wars and as a guard for gold shipments from the Black Hills inspired Edward L. Wheeler's "Deadwood Dick" dime novels.

DEAFNESS, complete or partial loss of the sense of hearing. Persons with hearing loss are deaf, hard of hearing, or deafened, depending on the age of onset and the degree of impairment and response to amplified sound. The deaf are those born without the sense of hearing; the deafened, those born with normal hearing who lost it in later life, and the hard of hearing, those who have some hearing but who cannot hear conversation at normal distances.

Loss of hearing in a child before birth or prior to language development renders hearing nonfunctional for the ordinary purposes of life. Such a child might have congenital deafness (deafness as a result of abnormal development of structures of hearing), or adventitious deafness (deafness as a result of hearing lost through trauma or illness).

Congenital deafness may be caused by congenital syphilis, meningitis suffered by the child before birth, drugs taken by the mother during pregnancy, German measles in the mother during the first three months of pregnancy, an incompatible Rh factor, severe birth injury, or cyanosis of the child caused by prolonged or difficult labor. (See SYPHILIS; MENINGITIS; BLOOD GROUPS, *Rh Factor;* CYANOSIS.) Deafness from these causes usually involves organic impairment of the auditory nerve, of any of the structures associated with the reception of sound, or both. Initial detection of the deafness is usually presumptive; that is, deafness is suspected because the infant is a "good" baby who seldom cries or is not readily disturbed.

The presence of such deafness may be established by the electroencephalogram (see ELECTROENCEPHALOGRAPH). Testing a child who has neither speech nor language involves the use of conditioned reflexes in which the residual hearing, or amount of hearing present, is first qualitatively ascertained and only later quantitatively determined. It is essential that a team of medical co-workers discover not only the amount of hearing but also the child's capacity for learning, and rule out possibilities of such disabilities as mental retardation, organic brain damage, and emotional disorders. Only then can recommendations be made to prepare the child to be self-sustaining, socially invincible, and educationally adequate.

Partial Deafness. Relatively simple conditions such as an accumulation of wax in the external auditory canal, the presence of a foreign body in the ear, or an infection of the skin that produces swelling, may interfere with the conduction of sound but seldom impairs hearing to a marked degree. A head cold or the presence of enlarged or swollen adenoid tissue may affect the Eustachian tube and so produce a conductive hearing loss. Since all of these conditions can be remedied, permanent hearing loss is not to be anticipated.

Some contagious diseases such as measles, scarlet fever, mumps, meningitis, and influenza, to which children are particularly subject, have a predilection for affecting the ear. Such diseases may affect the inner ear mechanism without outward manifestations of inflammation, or they may result in the accumulation of fluid or pus. This fluid or pus in the middle ear space or tympanum gives rise to otitis media; in the mastoid air cells it causes mastoiditis; in the inner ear spaces, labyrinthitis; in the covering of the brain or dura, meningitis; in the facial nerve or the venous blood spaces, sinus thrombosis (see EAR). Any one or all of these conditions may need medical or surgical care and cause varying degrees of hearing loss. The loss is usually conductive in character because the elements of the sound transmission system, such as the drum and ear bones, are affected, although the inner ear involvement may produce a perceptive loss. Hearing loss of the conductive type is frequently amenable to treatment, but the perceptive type can usually only be arrested.

An arrest of the hearing loss is the best that can usually be expected in injury from skull fractures, blows on the external ear, explosions, gunfire, or continuous loud noise. The extent of handicap from this hearing loss will depend upon the age of the person and amount of normal acoustic, speech, and language experience he had prior to onset of deafness; the amount of hearing loss; and miscellaneous factors embodying emotional maturity and educational opportunities.

Deafness may be inherited. The true hereditary deafness is present at birth, and is distinguished from congenital deafness in that it results from a genetic cause and not from structural abnormalities brought about by injury (see HEREDITY). There is a form of familial hearing loss, otosclerosis, which occurs mainly in females. It usually begins after puberty and slowly progresses. The individual affected is not able to compete with hearing persons in a normal acoustic environment, because the footplate of the stapes or stirrup becomes fixed in the oval window as a result of new bone formation; deafness from this cause is of the conduction type. In this condition hearing may be restored to a practical level by surgically mobilizing the stapes or by selecting and providing a properly fitted hearing aid.

Hereditary syphilis, acquired syphilis, and tuberculosis all affect the ear. Either can form its specific type of inflammation in any part of the ear, or the disease can attack the central connections of the auditory nerve. Deafness can also be caused by some drugs and chemicals, among which are quinine, the salicylates, mercury, nicotine, arsenic, lead, caffeine, amyl nitrate, and streptomycin. Such substances may induce irreversible perceptive types of hearing loss of profound degree. Hearing disturbance may be created by hemorrhage into the inner ear and by the same diseases which affect the brain and spinal cord. See BRAIN.

A first grader is given an individual test as part of a hearing conservation program. Tests are given routinely with reliable results to children as young as five years.
CHICAGO BOARD OF ED.

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Sixth grade pupils record their answers in a pure tone group screening test. Absentees and those who fail or show borderline hearing loss are retested six months later.

Impaired hearing affects 2 per cent of the population under five years of age, 4.5 per cent between 5 and 21, 2 per cent between 21 and 65, and an estimated 20 per cent over 65. It was further estimated that a greater percentage of hearing loss could be expected since people were living longer; industry was increasing the noise of the environment; contact sports such as boxing, and aquatic sports such as swimming and diving, were becoming more popular; air travel was entering the jet-propelled age; common colds and allergic states in association with incorrect or violent blowing of the nose were making possible the introduction of infection into the ear; and the heavy fire experiences of modern warfare were placing the hearing mechanism in great jeopardy.

F. L. Lederer, M.D.

Social and Personal Problems

Deafness occurs in varying degrees among all ages and economic groups. Any degree of hearing impairment is a socially isolating handicap because it interferes with communication.

The child whose hearing is normal learns to talk by imitating what he hears. Since the deaf child cannot hear conversation he must be taught to speak by other means. This is accomplished through two senses: sight and the kinesthetic, or tactile, sense. The deaf child learns to speak through imitation of the movements of the speech mechanism which he can observe, and through feeling. The deafened learn to talk normally but may develop speech defects because they cannot hear their own voices. The hard of hearing constitute the largest number of persons with impaired hearing. Since hearing loss is usually gradual in onset, a person can be hard of hearing without knowing it.

Educational Programs. Educational programs for children with impaired hearing are offered in many schools; approximately 3 per cent of all school children have some degree of hearing loss. The critical shortage of qualified teachers, however, has kept programs from developing adequately to meet the need. In June 1955, for example, only a few more than 100 teachers were graduated from 23 training centers in the entire United States. The only college for the deaf was Gallaudet College in Washington, D.C., maintained by the federal government; there were five schools for the deaf-blind in the United States.

In most areas deaf children cannot attend public schools until they are five or six years of age. There has been a trend toward accepting them younger, however, because educators believe that the earlier a deaf child's education begins, the better he will be able to talk and to read lips. Programs of parent education have increased, and classes for parents of preschool deaf children are held in most large cities. In some states annual institutes are conducted for parents from rural areas. In the majority of large cities there are hearing clinics where an individual child or adult can obtain scientific help in selecting the most appropriate hearing aid and in learning to use to the best advantage whatever hearing he has left. This help is known as auditory training.

Lip Reading and Sign Language. Lip reading, an important tool in combating the handicap of deafness, is taught to the deaf, the deafened, and the hard of hearing in both childhood and adult life. Lip reading is also referred to as speech reading; the deaf and the deafened must rely entirely upon it because they cannot hear conversation intelligibly even with a hearing aid; to the hard of hearing it may also be useful in conjunction with the hearing aid. Lip reading ability varies among individuals: the most important requisite is an aptitude for following context clues, since the eyes cannot possibly catch all the movements.

Some deaf children are not able to learn to talk and read lips well enough to communicate in this manner. For these youngsters the use of sign language and a manual alphabet is necessary. A disadvantage of this form of communication is that it is possible to use it only with others who know the same method. The manual alphabet is used to spell out words in the hands of the blind and deaf child in relation to objects he is given to handle and feel.

Most hard of hearing children and adults are helped by a hearing aid. The child may have to be enrolled in a special educational program in which he can be taught lip reading and the use of a hearing aid, and where he can obtain help with his speech. He may be transferred to a regular class after receiving this help, getting whatever further special assistance he might need on a tutoring basis.

Hearing Conservation. A hearing handicap often is not detected in the classroom. Special tests must be administered to find children who have a partial hearing loss. Tests, given by means of an audiometer, can be administered to as many as 40 upper grade pupils at one time. Group examinations are followed by individual tests where indicated; children in the lower grades are tested individually. Children who cannot be helped medically can be aided in other ways—by proper seating in the classroom, by placement in a special class, or by special tutoring. The process of finding these children and following up the tests and recommendations is called hearing conservation.

Hearing conservation programs are also in effect among workers in industry. The programs are particularly necessary in industries where there is a high noise level, since exposure to excessive noise can result in permanent loss of hearing. The Committee on Hearing Conservation of the American Academy of Ophthalmology and Otolaryngology has done research in the field and has published material to be used as a guide for industries wishing to inaugurate programs.

Many of the deaf and hard of hearing have difficulty making social and vocational adjustments to their handicaps. Chapters of the American Hearing Society provide counseling service and lip reading and recreational programs in various cities in the United States. Public agencies which offer vocational guidance and training are the Federal Office of Vocational Rehabilitation, through its state divisions, and the Veterans Administration. The Volta Bureau of the Volta Speech Association for the Deaf and the American Speech and Hearing Association also provide direct or indirect help for persons with impaired hearing. See Handicapped; Hearing Aid; Vocational Rehabilitation.

Mary L. Thompson

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DEÁK, FERENCZ, 1803–76, Hungarian lawyer and political leader, was born at Söjtör in the county of Zala. In the Austrian Diet after 1832, Deák, as the eloquent leader of the Liberal Reform party, called for legislation to better the peasants' lot, advocated taxation of the nobility (of which he was a member), and defended the constitutional rights of Hungary. In 1848 he was minister of justice and, although he continued his liberal policy, opposed the extremist views of Lajos Kossuth, leader of the unsuccessful revolution against Austrian rule, 1848–49. In 1861, after Emperor Francis Joseph I of Austria had consented to restore Hungary's constitution, Deák returned to political leadership. However, the Diet was dissolved by the emperor. After Austria's defeat by Prussia in 1866 Deák led the movement that brought about the restoration of Hungary's constitution and joined the country to Austria, forming the dual monarchy of Austria-Hungary.

DEAKIN, ALFRED, 1856–1919, Australian prime minister, was born in Melbourne and educated at Melbourne University. He was admitted to the bar in 1877; he soon became interested in politics and worked tirelessly for the cause of Australian federation. Deakin was three times prime minister of Australia in 1902–04, 1905–08, and 1909–10; and was celebrated as an orator and as a leader of popular causes. Deakin retired from public life in 1915 because of failing health.

DEAL, municipal borough, SE England, Kent, on the Strait of Dover, 14 miles ESE of Canterbury. Deal is a vacation resort and minor seaport. Boatbuilding and the manufacture of equipment for ships are the principal industries. Deal formed one of the Cinque Ports (see CINQUE PORTS). Walmer Castle, near Deal, is the official residence of the lord warden of the Cinque Ports and, together with Deal and Sandgate castles, was built by Henry VIII in the sixteenth century. Deal is the traditional landing point of Julius Caesar for his conquest of Britain (see ENGLAND). Pop. (1951) 24,276.

DEAL, any lumber of fir or pine origin. A standard deal measures 3 x 9 inches x 12 feet. Other deals include the whole deal, 1¼ inches thick; the slit deal, ⅝-inch thick; five-cut stuff, ½-inch thick or less; and deal ends, pieces less than 6 feet long. Quebec deal is northern pine that is 3 inches thick. In the United States yellow pine that is exported is called deal and measures 9 inches or more in width and 3, 4, or 5 inches in thickness.

DEALFISH, or ribbonfish, a group of rare, very fragile fishes ranging Arctic, temperate, and tropical seas. There are about 10 species of dealfish, genus *Trachypterus*, some 8 feet long. They are a brilliant silver with dark spots and blotches on their sides. The adults live in the upper layers of the sea, the young probably at considerable depth. Dealfish are very seldom caught or washed ashore, although a 2-foot *T. trachyrus* was beached after it entered shallow water off south Florida.

DEAN, BASHFORD, 1867–1928, U.S. zoologist, was born in Battle Creek, Mich., studied at Columbia University and in Munich, Naples, and Misaki (Japan), and became professor of vertebrate zoology at Columbia in 1904. He served as curator of fishes at the American Museum of Natural History, New York, 1903–10. Dean wrote several important works on the anatomy and embryology of fishes.

DEAN, GORDON EVANS, 1905– , U.S. public official, was born in Seattle, Wash. He was professor of criminal law at the University of Southern California, 1946–49, and chairman of the Atomic Energy Commission, 1950–53.

DEAN, JAY HANNA or **JEROME HERMAN,** known as Dizzy, 1911– , U.S. baseball player and member of the Baseball Hall of Fame, was born in Lucas, Ark. A colorful right-handed pitcher for the St. Louis Cardinals, 1932–37, and the Chicago Cubs, 1938–41, he won a total of 150 games, and was named the National League's most valuable player in 1934. After retiring from baseball he became a radio "sportscaster" noted for his ungrammatical, individualistic style in reporting major league baseball games.

DEAN, FOREST OF, wooded area and ancient royal forest, W England, W Gloucestershire, between the Severn and Wye rivers. The forest includes an area of hilly country about 20 miles from north to south and 10 miles from east to west. Most of the original forest has been destroyed but extensive reforestation has been carried out in recent years. Coal, iron ore, and stone are produced in the locality.

DEAN, an ecclesiastical official with varying duties and authority. The Latin *decanus* (one set over ten), from which it is derived, had both military and civil use; ecclesiastically, it designated the head of 10 monks or hermits. Augustine and Benedict mention such monastic deans. The chief of a chapter of canons serving in a cathedral church is its dean. Since the eighth century deans of cathedrals have been recognized as cathedral officers. In the Church of England the dean's authority is next to that of the bishop, and in his own cathedral is supreme except in matters of affecting doctrine. The dean of the Sacred College of Cardinals is usually the oldest cardinal, who presides in the consistory in the pope's absence. Rural deans in the Roman Catholic church have a delegated jurisdiction, restricted to a particular area and to certain matters designated by the bishop.

In English universities the dean of a college is responsible for behavior and discipline. In American and Scottish universities the head of each faculty is its dean. One who has belonged to an association or group longer than anyone else is referred to as its dean, as for example the dean of American statesmen.

DEANE, SILAS, 1737–89, U.S. diplomat, was born in Groton, Conn. He was graduated from Yale, 1758, admitted to the bar in 1761, and was one of the Connecticut delegates to the Continental Congress, 1774–76. Having accompanied Benjamin Franklin and Arthur Lee to France to obtain aid for the American Revolution, he entered into agreements with Lafayette, Von Steuben, Pulaski, and others for their personal services. Recalled by Congress to meet charges of extravagance in these matters, he returned to America early in 1778. The ensuing controversy necessitated another visit to France for the purpose of obtaining papers covering his financial transactions, but on his arrival in that country he learned that he had become *persona non grata* to the French government because of the publication of some of his dispatches. Deane retired to Holland and afterward to England, where he died in poverty, much embittered by his treatment by Congress. Congress in 1842 conceded that a considerable sum of money was due him and ordered it paid to his heirs. Deane published three brochures in his own defense. *Paris Papers, or Mr. Silas Deane's late Intercepted Letters to his Brother and other Friends* (1781), *Letters to Hon. Robert Morris* (1784), and *An Address to the Free and Independent Citizens of the United States of North America* (1784).

DEARBORN, HENRY, 1751–1829, U.S. soldier, was born in Northampton, N.H. He studied medicine and became a practicing physician, but on the outbreak of the Revolutionary War left his practice to raise a militia company, of which he was made captain. He served in the battle of Bunker Hill and in several other campaigns. He was secretary of war in the cabinet of President Jefferson, 1801–09, and at the outbreak of the War of 1812 was placed in command of the northern department. In 1822–24 he was U.S. resident minister in Portugal.

DEARBORN, city, SE Michigan, Wayne County; on the Detroit Terminal, the Chesapeake and Ohio, the New York Central, the Wabash, the Pennsylvania, and the Detroit, Toledo and Ironton railroads

HENRY FORD MUS. AND GREENFIELD VILLAGE

Stimulus for Greenfield Village at Dearborn, Mich., was restoration of Henry Ford's birthplace, a typical farm home of mid-1800s, with many of the original furnishings.

and U.S. highways 24, 25, and 112; 14 miles WSW of downtown Detroit. Dearborn is the site of the Ford Motor Company's River Rouge factory, one of the world's largest, covering about 1100 acres. In addition to automobiles, manufactures include airplane parts, metal products, precision tools, brick, and soybean products. Points of interest include Greenfield Village, the Henry Ford Museum, Dearborn Historical Museum, a veterans' hospital, and Henry Ford Community College, a junior college founded in 1938. First settlement in the area occurred following the relocation of the Detroit Arsenal here in 1832, where it remained until 1875. The present city was formed in 1929 by the union of Dearborn and the city of Fordson, formerly Springwells. (See GREENFIELD VILLAGE; FORD, HENRY.) Pop. (1950) 94,994.

DEATH is the cessation of the vital functions, the end of life, or the state or condition of being without life, animation, or activity. It is possible for a part to die without causing the death of the whole individual, and in certain forms of life death is not a regular phenomenon. Death of a whole individual is somatic death, after the Greek word *somatikos*, meaning corporeal or pertaining to the body.

Signs of Death are usually apparent but because a person in deep coma may appear to be dead it is necessary to look for certain signs before disposing of the body. The principal signs are cessation of the heart action and of respiration, loss of muscular tone, and insensibility to painful stimuli. The pulses cannot be felt nor can the heart beat be heard with the aid of a stethoscope. Breathing ceases, the chest becomes quiet, and no moisture forms on a mirror held before the nostrils and mouth, a sign that breathing has ceased. Muscle tone throughout the body is lost, the eyelids fly open, and the muscles in the pupils of the eyes relax so that the pupils dilate widely. The muscles of the extremities become flabby and, if not composed, the limbs assume contorted positions.

Shortly after death certain secondary changes take place. *Algor mortis*, or cooling of the body, occurs under ordinary conditions at about 1° per hour. *Rigor mortis*, or stiffening of the muscles, usually starts in the voluntary muscles within the first 12 hours and passes off in 3 or 4 days; it probably represents a chemical change characterized by precipitation of the proteins as the muscles become more acid. Because blood settles in certain parts some tissues are stained red, a condition called *livor mortis*. The blood clots, and the cornea of the eye becomes dry, glazed, and wrinkled. The final change is putrefaction, the process by which body tissues are broken down into simple chemical compounds.

Death of Parts of the Body. Although the vital functions cease at a particular moment in time, constituting death of the organism, individual tissues and cells of the body may continue to live for some time. For this reason surgeons can use segments of healthy arteries taken from fresh corpses to repair diseased arteries in living patients, or the transparent portion of a dead man's eye to replace the scarred one of a blind person (see CORNEA). This temporary survival of tissues after death probably also accounts for the claims that the hair and nails of a corpse continue to grow. Although a slight degree of growth of these tissues is possible, it cannot account for the more fanciful descriptions found in some romantic literature.

Occasionally during the course of certain diseases the artery to a limb or other part of the body may be blocked, causing the tissues in the affected part to die from a lack of oxygen and nutrients; such localized tissue death is necrosis or infarction. Infarcts of the heart as the result of obstruction of the coronary arteries are common, as are those of the lungs, intestines, and kidneys.

Immortality of Cells. Although man and most other higher types of life are mortal, death being inevitable, certain forms of life naturally enjoy immortality. For example, most one-celled animals like the familiar paramecium, when they grow old simply divide into two new individuals and life is renewed, leaving behind no dead body. This process will go on forever unless some accident occurs to destroy the organism. A similar phenomenon occurs in some plants and the nurseryman uses it to advantage in propagating some species. See REPRODUCTION IN ANIMALS; REPRODUCTION IN PLANTS.

In complicated many-celled animals, death is inevitable. That death is not necessarily a property of the individual cells can be easily shown, since cells of human beings or other mammals will grow for indefinite periods when removed from the body and placed in a suitable environment—a procedure called tissue culture. Similarly, fragments of tissue from an animal can be repeatedly transplanted into others of the same species for as long as it is desired to carry out the experiment. It is, therefore, a breakdown in the internal organization of the body economy and of the interrelations of the various tissues and organs that kills the organism and not an inevitable mortal process in the cells themselves.

Human beings also carry within their bodies certain special sex cells which are potentially immortal in one sense. The union of a male and female sex cell leads to the formation of a new individual whose sex cells are then capable of forming other individuals and so on indefinitely. This process assures the preservation of all species of two sexes, including the human race.

Causes of Death. Exceptionally complete records exist of the causes of human death during many periods of history; hence it has been possible to study the natural course of life and to detect changes in the way people die in this age as compared with the manner of death in other ages. It can be shown, for example, that during the last 2000 years man's life expectancy at birth has steadily increased. Progressively better sanitation accounted for most of this increase until about 1930, when control of infectious disease and malnutrition accelerated life expectancy in large areas of the world. In Breslau (Wroclaw, Poland) during the seventeenth century the expectation of life at birth was 33.5 years, and in the United States it was 51.5 years in 1910 and about 68 years in 1947. This striking increase has not proved an unmitigated blessing because the process has tended to preserve the weak individuals, who in former years were speedily eliminated by natural selection, principally through infectious disease or malnutrition. As a consequence there now appear in the higher age groups of the population more weak individuals than formerly. Therefore, the expectation of life beyond 65 is not nearly so great now as it was under the more rigorous circumstances of ancient times.

From the biological point of view this and other evidence indicates that an individual's inherited constitution fundamentally and primarily determines how long he will live.

As late as 1920 diseases of the respiratory tract, which were chiefly the result of pneumonia and tuberculosis, and infections of the alimentary tract were the two commonest causes of death. By 1940 a noteworthy change in the causes of death had become apparent. Diseases of the respiratory system occupied fifth or sixth place and diseases of the alimentary tract were even lower in the scale. Heart disease, cancer, and arterial disease of the brain had assumed first, second, and third places, and accidents were in fourth or fifth place. This striking alteration was largely brought about by the widespread use of sulfonamide and antibiotic drugs.

Death in Art and Literature. The fact of death has had a profound effect not only on science but also on literature, art, philosophy, and religion. In Greek mythology Sleep, *Hypnos*, and Death, *Thanatos*, were twin brothers in the family of Night (which also includes the Fates, Hesperides, Nemesis, Care, and Momus, god of ridicule and adverse criticism). Sleep and Death resided along the Western sea in subterranean darkness along with their other brothers, Dreams. The twin brothers appear frequently in the *Iliad* and Hercules' struggle with Death for Alcestis, the daughter of Pelias, is described in Robert Browning's poem *Balustion's Adventure*. Numerous ancient Greek vase paintings and statues depict Death. The imprint of death upon Egyptian art and life is pervasive. During the Middle Ages numerous artists used the Dance of Death theme and the artistic device of the Bridge of Life is still employed (see Dance of Death).

During the Golden Age of Christian painting and sculpture the deaths of the martyrs, saints, and priests formed frequent subjects. The death of Christ on the cross has inspired a whole body of unique art, since it was this event which gave meaning to the Christian religion. All religious systems have posited some solution to the problem of death. Most religions are unable to accept death as a biological process or cessation of process and nothing more—its significance for life must be explained. Modern artists seem less occupied with death as a subject of representation, although Goya, Picasso, and others have denounced the horrors of war by means of death themes. In music, too, the theme of death is a common one and some of the greatest symphonies contain magnificent death marches. The *Dies Irae* (Day of Wrath) sequence has been employed by many composers. See Dies Irae. W. B. Wartman, M.D.

Legal Aspects. A violent death, as distinguished from a death resulting from natural causes, must be investigated by the county coroner or medical examiner to determine whether foul play occurred. Legally, a given condition once established as existing continues; therefore the continuance of life is presumed. However, the unexplained absence of a man for an uninterrupted duration of seven years raises a presumption of death.

In those states of the Union in which the community property system prevails there is the legal fiction that the law of community property takes effect simultaneously with death. This legal fiction also holds that the law of wills or descent and distribution takes effect immediately thereafter.

DEATH, DANCE OF. See Dance of Death.

DEATH ADDER. See Adder.

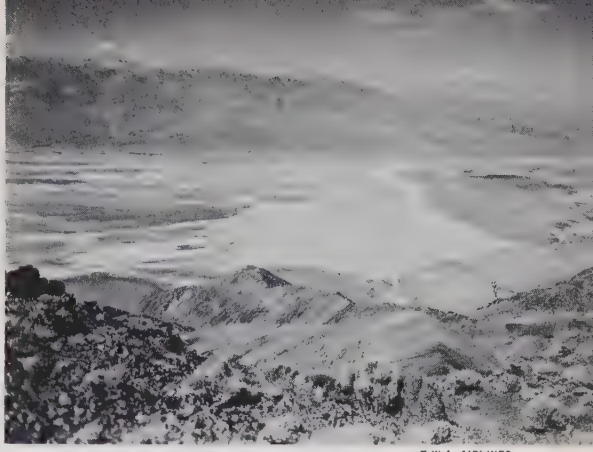
DEATHBED DECLARATION. See Declaration.

DEATH CUP. See Mushroom.

DEATH DUTY. See Inheritance Tax.

DEATH RATE. See Vital Statistics.

DEATH'S-HEAD MOTH, a large European moth belonging to the Sphinx family, *Sphingidae*, which owes its name to the fact that the body bears a peculiar mark somewhat resembling a skull and crossbones. The caterpillar is about 4 inches long, brightly colored, and has a hornlike appendage near the tail. It is chiefly nocturnal in its habits. When full fed, it burrows in the earth and there pupates. The adult moth has a dark plum-colored body striped with black. The fore pair of its soft and downy wings are brown with yellow spots and markings; the hind pair are yellow, banded with black. A remarkable characteristic of this moth, *Acherontia atropos*, is its ability to produce a squeaking noise.



T.W.A. AIRLINES

Death Valley, seen from Dante's View, is an arid waste against a backdrop of Telescope Mountain, left background. A part of the valley is the lowest spot in North America.

DEATH VALLEY, arid basin, SE California and S Nevada, between the Panamint Range on the W and the Amargosa Range on the E. Death Valley is about 140 miles long and varies in width from 4 to 15 miles. It was formed by faulting which caused a roughly rectangular block of the earth's crust to become lowered. A portion of the valley is 282 feet below sea level, the lowest point on the North American Continent. Nearby mountains rise above 11,000 feet, presenting a spectacular abrupt rise in elevation. The precipitation in Death Valley is scanty, averaging only slightly more than 1 inch in an average year. Winter temperatures are mild, the summers extremely hot. The record United States high temperature of 134°F was registered in Death Valley, and daily high temperatures above 120°F may occur several days in succession. Two streams, Furnace Creek and the Amargosa River, enter Death Valley from the surrounding uplands but lose their water by evaporation and seepage after flowing short distances across the valley floor. Numerous saline deposits occur in the valley.

Death Valley's great scenic interest includes multicolored strange rock formations, sand dunes, desert vegetation and wild life, and fossilized remains. The region was named for a party of gold prospectors in 1849, some of whom died in crossing the valley. Gold, silver, copper, and particularly borax were formerly produced. Death Valley, together with the adjacent area, forms Death Valley National Monument (1,749,658 acres in California; 115,240 acres in Nevada) and attracts numerous tourists. Furnace Creek and Stovepipe Wells are the principal resorts.

Bibliog.–G. P. Putnam, *Death Valley and Its Country* (1946); W. L. Manly, *Death Valley in '49* (1949); W. Caruthers, *Loafing Along Death Valley Trails* (1951); W. A. Chalfant, *Death Valley* (ed. 1953).

DEATHWATCH, a small cylindrical beetle of the family *Anobiidae*. This beetle, *Xestobium rufovillosum*, is named for the curious ticking sound it produces as it bores through wood. The beetle is destructive to drug and grocery products.

DEAUVILLE, town, NW France, in the department of Calvados; on the English Channel at the mouth of the Touques River across from Trouville; 9 miles S of Le Havre. It has a 2-mile boardwalk

along its magnificent sandy beach, bordered with luxurious hotels, gardens, and a casino. The horse racing course is the site of the Grand Prix de Deauville, held in August. The town was damaged by shelling during the Allied invasion in World War II. Pop. (1954) 5046.

DE BARY, HEINRICH ANTON, 1831–88, German botanist and biologist, was born in Frankfurt-am-Main and studied at the universities of Heidelberg and Berlin. He was professor of botany at the University of Freiburg, 1855–66, the University of Halle, 1867–72, and in 1872 became first rector of the University of Strasbourg where he carried out research in the life cycles of fungi, particularly the parasitic species. On the publication of *Morphologie und Physiologie der Pilze, Flechten, und Myxomyceten* (1866) he became known as the founder of the science of mycology, that branch of botany concerned with fungi. He also wrote on bacteriology and the comparative anatomy of ferns.

DEBATE, a formal, spoken discussion of the pros and cons of a subject by two individuals or groups under established rules. Debate has been used to influence legislation since the first parliament met in England in the thirteenth century. With the growing complexity of government, the adherence of legislators to party lines, and the simple expedient of a news conference as a means of communication, parliamentary debate lost much of its influence. In team debating in schools and colleges it is customary to have three speakers for the affirmative and three for the negative side of a question. The debate is opened by the first speaker for the affirmative, who is followed by his opponent on the negative side, and he in turn by the other debaters alternately one from each side. In rebuttal the order of speakers may be reversed, but the points argued are limited to the subject matter already presented. The outcome is judged on the merits of the arguments and the excellence of presentation.

DEBENTURE, a form of security given by companies for money advanced to them on loan. Debentures are, however, sometimes issued by clubs, and even by individuals. A debenture is usually, but not always, a specialty; it acknowledges indebtedness on the part of the debtor, and contains a promise to repay the principal either at a specified date or only on the occurrence of certain contingencies, with interest in the interim. Debentures are generally secured by a deed of trust vesting certain property in trustees, who are given a power of sale on the company making default; generally, too, the debentures themselves contain either a floating charge on the company's property as a whole, or a specific charge on some particular part of the undertaking. See BOND.

DEBIT AND CREDIT. See BOOKKEEPING.

DEBORAH, in the old Testament (Judges 4–5), an Israelite prophetess, poetess, and judge (the only woman to hold that office, according to the Bible). Having enlisted the aid of Barak, a warrior of Issachar, she led the Israelites to victory over their oppressors, the Canaanites. She may possibly have been the author of the famous ode of triumph, *The Song of Deborah* (Judges 5), generally considered one of the finest pieces of poetry in the Bible.

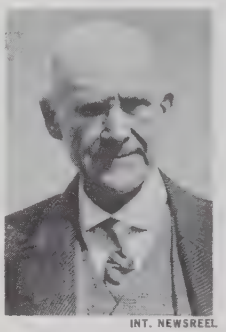
DEBOYNE ISLANDS. See LOUISIADE ARCHIPELAGO.

DEBRA MARKOS, town, central Ethiopia, capital of the province of Gojjam, on the S slope of the Choke Mountains; 110 miles NW of Addis Ababa. Debra Markos is a trading center for agricultural products raised in the surrounding region, principally coffee, grain, hides, and beeswax. Pop. about 10,000.

DEBRA TABOR, town, N central Ethiopia, in the province of Begemdir; 190 miles NNW of Addis Ababa. Cattle, sheep, and grain are produced in the adjacent agricultural area. The city was Ethiopia's capital during the 1800s. Pop. about 9000.

DEBRECEN or **DEBRECZEN,** city, E Hungary, capital of the county of Hajdu-Bihar but independent of it; it is 118 miles E of Budapest. Debrecen is a transportation and trading center for a farming area. Medical instruments, ball bearings, pharmaceuticals, clothing, flour, fertilizer, beer, salami, bacon, beet sugar, and soap are the chief products. There are railroad shops and tanneries. The city is the seat of the Lajos Kossuth Scientific University and Medical University, founded in 1914, the Reformed (Calvinist) Theological Academy, and an agricultural college. Déri Museum has Munkácsy's famous painting *Ecce Homo*, a folk art collection, and a 25,000-volume library. Debrecen was the headquarters of Protestantism in Hungary; a Calvinist theological college was founded here in 1588. In 1849 Louis Kossuth (see KOSSUTH, LOUIS) proclaimed Hungary's independence at Debrecen. During World War II, in 1944, the city was taken by Soviet troops, and later in the year was the temporary capital for the provisional Hungarian government. Pop. 95,174.

DEBS, EUGENE VICTOR, 1855–1926, U.S. labor leader and a founder of the Socialist party, was born in Terre Haute, Ind. After leaving school at the age of 15, Debs was a locomotive fireman, city clerk of Terre Haute, 1879–83, and in 1884 a member of the Indiana legislature. Because of his leadership in the Brotherhood of Locomotive Firemen, he was elected its national secretary and treasurer in 1880. Believing that an industrial union of all railroad workers would be more effective than a trade union, Debs formed the American Railway Union, of which he was president, 1893–97. In 1894, after winning several strikes, the strength of Debs' union was thrown against all the railroads entering Chicago. In sympathy with striking Pullman workers, Debs directed his members not to move Pullman cars, even though he is said to have opposed the boycott. Arrested on a conspiracy charge and acquitted, he was sentenced in 1895 to six months' imprisonment for violating a federal injunction. Debs studied socialism in prison, and in 1897 organized the Social Democratic party; as its presidential candidate in 1900 he received 96,000 votes. He polled 402,000 votes as the Socialist party's nominee in 1904, and increased his vote to 420,000 in 1908 and to 901,000 in 1912. He was a founder of the Industrial Workers of the World, 1905, but soon withdrew his support. After 1907 he was editor of the Socialist weekly, *Appeal to Reason*, and later edited *National Rip-Saw*. Debs became known as a public speaker; however, his speech in 1918 against U.S. participation in World War I brought a sentence of 10 years in prison for violation of the Espionage Act. Despite his imprisonment, Debs received 919,000 votes as a presidential candidate in 1920. He was released in 1921 by order of Pres. Warren G. Harding.


INT. NEWSREEL
Eugene V. Debs

DEBT, any obligation, whether present or future, which must be discharged by a money payment. Strict common law, however, restricts a debt to an obligation calling for the payment of a definite sum presently or at a specified time in the future or on demand. In this sense debts are classified as simple contract debts, specialty debts, and debts of record, sometimes improperly called contracts of record. The simple contract is created by an agreement by parol or in writing not under seal to pay a liquidated sum of money at a given time; a specialty debt arises from a similar promise or agreement contained in an instrument under seal, such as a bond; a debt of record is a judgment for a definite sum of money, whether for breach of contract, tort, or other cause of action, duly entered in a court of record.

The common law remedy against a defaulting debtor is an action of debt. In certain cases, especially where the debt is one of record, modern statutes generally provide a process of a summary nature. Ultimately the creditor's claim is satisfied by execution against the debtor's estate. In the administration of the estates of bankrupts or decedents, debts of record are taxes and excise duties; debts due the state are given preference over those due to private persons. The preference formerly accorded to specialty over simple contract debts has been generally abolished by statute. In the absence of statute an insolvent debtor may prefer one creditor over another and may pay his debts in the order he chooses. Modern bankruptcy statutes usually forbid such preferences in the interests of the state and of the general creditors.

The treatment of debt as a pecuniary obligation to be satisfied out of the estate of the debtor, and not as a breach of faith involving turpitude and punishment, is a result of the reorganization of society on a commercial basis. Primitive law makes little or no distinction between the position of one who fails to meet his legal obligations and one guilty of crime. Both are liable to have their person seized by the injured party. This is exemplified both in the ancient Jewish law and the laws of Greece and Rome. In the Roman law the insolvent debtor became the slave of his creditor. By the common law of England for several hundred years debtors were subject to imprisonment at the pleasure of their creditors, or until their debts should be discharged. Imprisonment for debt also prevailed in many of the American states. It was abolished in the United States about 1831, but survived in England until 1868. The liability to arrest in civil actions for debt which still remains is based not on the debt, but on the fraud or other misconduct by which a debtor may seek to deprive a creditor of his legal remedy for the satisfaction of the debt. See Absconding; Attachment; Bankruptcy; Public Debt; Garnishment; Limitations, Statute of; Sinking Fund.

DEBT, PUBLIC. See Public Debt.

DEBUSSY, CLAUDE ACHILLE, 1862–1918, French composer whose works mark the end of the period of romantic music and the beginning of twentieth century "new" music, was born of middle-class parents at St. Germain-en-Laye. He began the study of piano and theory at 10 years of age but during 11 years of training at the Paris Conservatoire did not distinguish himself as either pianist or conductor. As a composer, however, Debussy displayed a personal style and an ingenious sense of musical innovation that was rewarded in 1884 by the Grand Prix de Rome for the cantata *L'enfant prodigue* (The Prodigal Child).

NEW YORK PUB. LIB.
Claude Debussy

Except for two years in Rome, a summer in Russia, and other short travels, Debussy lived his life in Paris. His literary taste inclined to the symbolist poets (Baudelaire, Verlaine, Rimbaud, and Mallarmé); the five Baudelaire songs of 1890, three Verlaine songs in 1891, six songs later set to Verlaine poems, and the orchestral work *Prélude à l'après-midi d'un faune* (Prelude to the Afternoon of a Faun), after the verses of Mallarmé, testify to the influence of poetry upon his music. Debussy's ability to make music from the sights, sounds, and the atmosphere of life linked him not only with the symbolist poets but also with the impressionist painters, with whom he shared an interest in rapid changes of light, the feel of falling snow, and the movement of water. Such piano pieces as *Et la lune descend sur le temple qui fut* (And the Moon Descends on the Temple that Was), *Feux d'artifice* (Fireworks), *The Snow Is Dancing*, and *Reflets dans l'eau* (Reflections in the Water) are examples of impressionistic program music.

Musically he developed a highly personal harmonic and contrapuntal style. In many works he employed the whole tone scale, which uses six instead of the traditional seven tones and eliminates the perfect fourth and fifth as well as the strong leading tone to tonic (see Scale). He modified the traditional seven-tone scale in order to reduce the strength of the tonic, subdominant, and dominant tonal centers; this had the effect of greatly equalizing the function of the various tones, thus presaging Schönberg's atonal, 12-tone, chromatic scale which theoretically lacks any tonal center (see Harmony). Debussy also used chords containing perfect fourth and fifth intervals in parallel motion, thus creating chords without function, one chord being similar in structure to another (see Chord). Debussy's unorthodox techniques as a composer were characteristically his own, and did not derive from or lead to any system or school. His obscure chords and melodies, often chosen for pure overtone sound effect, serve to produce for the listener a quality which is sometimes suggestively languid and effete. In Debussy's music, chords and tones do not resolve naturally or traditionally but rather remain suspended in an unorthodox way.

Debussy worked mainly in the smaller forms. Much of his music is for the piano, small pieces being grouped under such titles as *Préludes*, *Études*, *Images*, *Suite Bergamasque*, *The Children's Corner*, *Pour le piano*. There are also groups of songs. His orchestral works are frequently cast in small forms such as the *Nocturnes*, *Images*, *Symphonic Suites*, and *Sketches*. He composed a few sonatas (one for violin and piano, one for cello and piano, and another for viola, flute, and harp), and one string quartet. He produced much incidental music as settings to plays and verses; the music to *King Lear* and the music to the poetry of Dante Gabriel Rossetti and Gabriele d'Annunzio are examples of this strain in his work.

Debussy's largest work is the opera *Pelléas et Mélisande*, adapted from the Maurice Maeterlinck play. This opera is in many ways the culmination of Debussy's artistry, for it combines successfully many literary images and poetical ideas with his most mature music. The music of *Pelléas et Mélisande* strongly and sensitively reflects many extra-musical ideas, somewhat resembling the Wagnerian operas in its literary emphasis and abundance of unresolved chords, but differing greatly from them in its delicacy of sound and tone color. The string quartet and violin sonata are both noteworthy works, particularly well suited to the pure quality of string instruments. The piano music demands a special type of "listening" by the performer, rather than great finger dexterity, if the proper musical result is to be achieved. Because the complexity and size of the standard modern symphony orchestra often weighs on the orchestral performance of impressionist music, rendering it dense and overly sonorous, it requires a sensitive conductor and orchestra to bring out the transparency and seeming breathlessness of Debussy's music. Often he achieved an orchestral brilliance by writing solo parts for instruments not usually heard in this way; thus his *Danses* for harp and orchestra is a work important for its orchestral tone color.

Debussy's influence upon other composers was not extensive. Scriabin, in his later works, began a thorough systematization of chords built on fourths such as were first used by Debussy, but neither he nor Debussy himself ever really broke totally with the traditional structure of European music. Erik Satie employed Debussyesque ideas satirically to demonstrate the fading power of romanticism. Although Debussy began his career as an anti-romantic, it cannot be maintained that his music is untainted with romanticism. His music is often sensuous and ecstatic, but it can be forceful and rise above the purely emotional. His musical method, since it lacked virility and

universality, did not evolve into a formal theory, but within the framework in which he chose to work his innovations are extremely successful. See Music.

Elaine Gurevitz

DEBYE, PETER JOSEPH WILLIAM, 1884–, U.S. physicist, was born in Maastricht, Netherlands. He was awarded the 1936 Nobel prize in chemistry for his contributions to the study of molecular structure. His work with E. Hückel led in 1923 to the important Debye-Hückel theory of concentrated solutions. After 1940 Debye was professor of chemistry and department chairman at Cornell University.

DECADENCE. See Social Change.

DECAGON. See Polygon.

DECALCOMANIA, the process of printing designs and other matter on special paper so that the printed matter can be transferred from the paper to another surface. A layer of "decal gum" is applied to the paper and the design is printed directly over it with a flexible ink. The adhesive may be water soluble, so that when the decal is moistened, the design can be slid off its paper backing and, having retained some of the gum, be applied while still wet to almost any flat surface.

Size of the decal may vary from quite small to mural-size, up to four feet square. Several printing processes may be used in producing decals, including lithography, letterpress, intaglio, or screen-process printing. Photographs can be successfully transformed into decals; thus wood grain, marble, stone surface, and other such patterns can be applied to furniture and walls to simulate the original material. Special decals can be applied to fabrics and plastics, making possible such things as simulated alligator leather.

The origin of the word decalcomania is obscure, but it was probably coined from the French *decalquer*, to transfer, and *manie*, craze or mania. This conveys the tremendous excitement which greeted the invention of the process in the early nineteenth century, after the discovery of lithographic printing from etched stone by Aloys Senefelder. The craze reached its peak during the Victorian era, and decals continued to be popular into the twentieth century.

DECALOGUE. See Ten Commandments.

DECAMERON, THE, generally considered the greatest and essentially the first of Italian prose masterpieces, was written by Boccaccio (see Boccaccio Giovanni). Begun about 1348 and finished in 1353, it consists of 100 stories presented as though told during a 10-day period by a group of three young men and seven young ladies who fled the city of Florence to escape the Black Death (bubonic plague) which swept over the whole of Europe in 1348. *The Decameron* is a miracle of design in that its formal organization is such that no subject of life is inappropriate to it. The frame of horror against which the tales are set is a universal pestilence from which the 10 protagonists have managed to escape; in the seclusion of a great and beautiful villa garden they choose a "queen for the day" and abide by her suggestion that they take turns in telling stories to help forget their troubles. Under such circumstances Boccaccio's characters felt free to discuss the subjects of greatest interest to them.

Boccaccio's plan for *The Decameron* has never been bettered, although perhaps equaled by Chaucer in his *Canterbury Tales*. Boccaccio's storytellers do not have distinct personalities, but each of the pilgrims of *The Canterbury Tales* seems a complete human being. In Chaucer's work the tales may become tiresome, but the tellers never do; in *The Decameron* the storytellers are personally uninteresting, but their tales are entrancing. The vivid and living stories told by Boccaccio's young and fair protagonists are the substance of the work and, while the storytellers may be forgotten, the world their stories create never is.

The 100 tales of *The Decameron* may be traced to a number of sources—Egyptian, Arabian, Persian, Indian, the *contes* and *fabliaux* of France, the *Gesta romanorum*. Boccaccio probably never concerned himself with the ultimate origins of the stories, gathering them (as he did) up and down Italy as the folklore of his own time. He took what he wanted in the way of material and made it uniquely his own by his manner of telling; that this or that tale had its counterpart in ancient Egypt matters little. The book reflects the variety of the universe and of the people in it, yet at the same time gives the reader a vivid picture of life in fourteenth century Italy, since the stories are realistic in tone and crammed with observations of the customs and types which made up the life of Boccaccio's time. *The Decameron*, with its irony, its ribald humor, its kindly tolerance of human error, is essentially humanistic in approach; indeed the work has been criticized for just this fact—its broadness of viewpoint, its lack of a so-called moral sense or idealism.

The author was a product of the rising middle class of early Renaissance Italy and almost certainly intended to depart from earlier ideas and standards. *The Decameron* is a bitter satire against what Boccaccio felt to be the evils of established institutions. He produced a book dealing with life and living people—stories of adventure, illicit love, evil clergymen, deceived husbands, faithful and faithless wives—all the elements he saw making up the real world of man. Written in a beautiful but complicated prose style, the work is often lacking in simplicity, but has merited immortality for its appeal to mankind.

The Decameron, though widely read and enthusiastically received, was also severely censured in its own day, and in the Conclusion Boccaccio apologizes for what he fears may be considered too great a license. Yet he defends himself, saying, "There is nothing so unseemly as to be forbidden unto anyone, so but he express it in seemly terms, as methinks I have very aptly done."

With succeeding centuries and untold numbers of editions in many languages, the work made an ineradicable impression on European literature. In Germany Hans Sachs; in France Molière and La Fontaine; and in Spain Lope de Vega were all in his debt. The greatest of English writers—Chaucer, Sydney, Shakespeare, Dryden, Keats, and Tennyson—were influenced by the book. The first essentially complete English translation was published in 1620 with the translator's name omitted; the first really unexpurgated English edition was that by John Payne, printed for the Villon Society in 1886.

Rachel Gilbreath

DECAMPS, ALEXANDRE GABRIEL, 1803–1860, French painter, was born in Paris. After spending a year in the Near East, in 1831 he held an exhibition of paintings of oriental subjects, including the *Turkish Patrol* and the *Grand Bazaar*. The exhibit brought him great popularity and did much to establish the orientalist trend later followed by such masters as Delacroix. Decamps' painting was characterized by a peculiar treatment of light and shade which enhanced the exotic qualities in his subject matter.

DECAPODA. See Crustacea.

DECAPOLIS, an ancient region largely in Palestine, to the east and south of the Sea of Galilee, deriving its name from a league of ten cities formed in the area in the first century B.C. Damascus, Gadara, Pella, and Scythopolis were among the important members; the others varied from time to time.

DECATHLON, an all-round track and field contest consisting of 10 events. A feature of the Olympic Games since 1912, the decathlon includes the broad jump, high jump, discus throw, shot-put, javelin throw, pole vault, 110-meter high hurdles, and 100-, 400-, and 1500-meter races. Each event is scored on the basis of 1000 points against standards established in 1934, with an average of 79 per cent, or 7900 points, being an excellent performance. See Olympic Games.

DECATUR, STEPHEN, 1779–1820, U.S. naval officer, was born in Sinepuxent, Md., and entered the navy in 1798. During the war with Tripoli, 1801–05, Decatur and his men slipped into Tripoli harbor on Feb. 16, 1804, boarded the captured U.S. frigate *Philadelphia*, routed the enemy, and burned the ship. For this act, which Adm. Horatio Nelson of the British navy called "the most daring feat of the age," Decatur was promoted from lieutenant to captain.

CHICAGO HIST. SOC.
Stephen Decatur

During the War of 1812 Decatur was commodore in command of the squadron which on Oct. 25, 1812, captured the English frigate *Macedonian*. Decatur again engaged the British, on Jan. 14, 1815, when with one ship he fought four of the enemy's. Decatur was wounded in the battle and taken prisoner. Paroled in February 1815, he returned to the United States, and was again acclaimed a hero. In May of the same year he commanded a squadron against Algiers, forcing the Dey of Algiers to end his demands for United States tribute. Returning as a hero for the third time, Decatur made his famous response to a toast at a dinner in his honor in Norfolk, Va.: "Our country! In her intercourse with foreign nations may she always be in the right; but our country, right or wrong!" After November 1815 Decatur was on the board of navy commissioners. He was killed in a duel at Bladensburg, Md., on Mar. 22, 1820, by Capt. James Barron, a suspended officer whose reinstatement Decatur had opposed.

DECATUR, city, N central Alabama, county seat of Morgan County, on the Tennessee River, on the Southern and the Louisville and Nashville railroads and U.S. Highway 31; 76 miles N of Birmingham. The principal manufactures are hosiery, synthetic fibers, copper tubing, metal products, steel products, insecticides, fertilizers, and air conditioning units; industries include chicken processing, meat packing, and dairy plants. The city was named for Com. Stephen Decatur. Pop. (1956 special census) 22,551.

DECATUR, city, NW Georgia, county seat of De Kalb County, on the Georgia Railroad and U.S. highways 29 and 78; 6 miles E of Atlanta, a part of Atlanta's metropolitan area. A residential city, Decatur is the seat of Agnes Scott College for women and Columbia Theological Seminary. Its principal manufactures are processed foods, rubber products, and machinery. On Stone Mountain (see STONE MOUNTAIN), a granite hill about 9 miles east of Decatur, is an incomplete memorial to the Confederacy. Pop. (1950) 21,635.

DECATUR, city, central Illinois, county seat of Macon County; on the Sangamon River; on the Baltimore and Ohio, the Illinois Central, the Wabash, the Illinois Terminal, and the Pennsylvania railroads and U.S. highways 36 and 51; 37 miles E of Springfield. Decatur is located in a soybean and corn raising area and is well known for its soybean processing industry. Other important manufactures are corn products, water and gas distribution systems, pumps, plastics, agricultural implements, automotive parts, glass, and plumbing fixtures. There are large railroad shops. The town was settled in 1829 and incorporated in 1839. Abraham Lincoln's first home in Illinois was about 10 miles west of here. Decatur was a supply depot during the Civil War and the first post of the Grand Army of the Republic was organized here in 1866. The city is the site of James Millikin University, founded in 1901. The Sangamon River was dammed in 1923 to give the city a water supply and a recreational area. The reservoir is called Lake Decatur. Pop. (1950) 66,269.

DECATUR, city, NE Indiana, county seat of Adams County; on the St. Marys River; on the Erie, the Nickel Plate, and the Pennsylvania railroads and U.S. highways 27, 33, and 224; 7 miles from the Ohio state line and 21 miles SE of Fort Wayne. Decatur's principal manufactures are cement, tile, dairy and wood products, soybean products, castings, and electrical machinery. Pop. (1950) 7271.

DECCAN, THE, plateau, comprising most of S India, bounded by the Satpura Range and Chota Nagpur Plateau on the N, the Eastern Ghats on the E and SE, and the Western Ghats on the SW and W. The Deccan has a general elevation of about 2000 feet, higher in the west and lower in the east. Much of its area is made up of great lava beds. By Deccan is sometimes meant all of peninsular India. See DELKARIA.

DECCAN STATES. See KOLHAPUR AND DECCAN STATES AGENCY.

DECEIT. See FRAUD.

DECEMBER. See MONTH.

DECEMBRIST RISING. See RUSSIA, History, *Period of Reaction.*

DECEMVIR, one of a court of 10 men in ancient Rome. The *decemviri legibus scribendis*, 451 B.C., published the Laws of the Twelve Tables, which formed the basis of later Roman law. Another body of *decemviri* had charge of the Sibylline Books, and a third had jurisdiction in suits over the freedom of slaves.

DECENTRALIZATION, in government, is the transfer of authority from a central to a local seat, as from nation to state or province or from state to municipality. Another kind of decentralization is devolution, whereby a central government delegates some of its powers to its territorial or functional subdivisions. Although the general trend in modern times has been one of centralization there has been at all times an opposing tendency, such as that of states' rights. The only movement toward decentralization which enjoyed much support in the United States after 1900 was that of municipal home rule, under which cities have the authority to frame their own charters free from control by state government.

Outside the United States the organization of the British Commonwealth of Nations to replace the old British Empire is an example of decentralization; this change involved making self-governing dominions of former colonies. In the United Kingdom itself there has been a resurgence of Scottish and Welsh nationalism in recent decades, demanding regional parliaments with authority over local affairs. In France the central government exercises a high degree of control over the local units of government, but there are advocates for a shift of this power.

Another type of decentralization is the movement to decrease the size of industrial manufacturing units and to disperse them geographically in order to effect economies of production and surmount the social disadvantages of large industrial cities. See GOVERNMENT; DEMOCRACY; STATE; LOCAL GOVERNMENT.

DECEPTION ISLAND, in the South Shetland Islands, about 150 miles N of the Palmer Peninsula, Antarctica. A horseshoe-shaped volcanic island with a natural harbor, it is a haven to Antarctic expeditions and whaling ships. It is claimed by Great Britain, Chile, and Argentina.

DECIBEL. See SOUND, *Loudness.*

DECIDUOUS PLANT, any tree or shrub that loses its leaves in autumn and remains leafless throughout the winter, in contrast to evergreens, which retain their leaves throughout the winter. (See LEAF.) Leaf fall is brought about by the formation of a special layer of cells, the abscission layer, across the base of the leafstalk. The walls of the abscission layer disintegrate and wind action ruptures these cells, causing the leaf to fall. When the leaf falls the cells just below the abscission layer become corky and form a protective layer over the leaf scar.

DECIMAL, a symbol, usually a period, used to designate the relative size of a number with 10 as its base. The decimal fractions 2/10, 23/100, and 23/1000 expressed in decimal notation are written .2, .23, and .023 respectively. The decimal place is the position of a particular digit to the right of the decimal point. For example, the decimal number 4.782 has three decimal places: 7 is in the first decimal place, 8 in the second, and 2 in the third. By multiplying 4.782 by 10, the first decimal place is shifted one digit to the right and the number becomes 47.82. If the number be divided by 10, the first decimal place is located one digit to the left, making the number .4782. When decimal numbers are added or subtracted, the decimal points should be placed directly under each other. Thus, the sum of 2.23 and .04 is 2.27, and the difference of the two numbers is 2.19. The multiplication of two decimal numbers requires the answer to contain the sum of the decimal places present in the two numbers. Thus, 2.23 multiplied by .04 would give an answer with four decimal places, or .0892. In the division of decimal numbers the decimal point in the divisor is moved to the right the required number of decimal places to make the divisor a whole number. The decimal point in the dividend is then moved to the right an equal number of decimal places. Thus, when 2.23 is divided by .04, the divisor is rewritten as 4 and the dividend as 223. The quotient, or answer, is 55.7. See Arithmetic; Metric System; Number and Number System; Binary Notation.

DECIMAL CLASSIFICATION SYSTEM. See Dewey Decimal System.

DECIUS, full name Gaius Messius Quintus Trajanus Decius, 201?–251, Roman emperor, was born in Pannonia. A professional soldier, he was ordered to put down a revolt of the troops in Moesia but the army proclaimed him emperor, supposedly against his will. Still protesting his loyalty to the emperor Philip, Decius met him in battle at Verona and Philip was killed. Decius is considered to have been a just and capable administrator but was implacably hostile to Christianity; during his brief reign, 249–251, the bishops of Antioch and Jerusalem were jailed and Pope Fabian was executed. Decius and his son were killed in a campaign against the Goths at Forum Trebonii.

DECIUS MUS, PUBLIUS, three Roman consuls of the same name: father, died 340 B.C.; son, died 295 B.C.; and grandson, died 279 B.C. All were supposed to have sacrificed themselves heroically in battle in order to assure victories for the Roman army, but historians think it probable that only the second Decius actually did so (at Sentinum, against the Gauls). The family was held up to Roman soldiers as a noble example of bravery beyond the call of duty.

DECIZE, ancient Decetia, town, central France, in the department of Nièvre, on an island in the Loire River, at the terminus of the Lateral Loire and the Nivernais canals, 18 miles SE of Nevers. Iron, glass, and ceramics are manufactured. The church of Saint Aré (about 1200) and the ruins of the counts of Nevers' castle are in Decize. Julius Caesar held a senate meeting there, 52 B.C., to determine the leadership of the Aedui tribe. Pop. (1954) 4123.

DECK TENNIS, a shipboard game similar to tennis or badminton played on a singles court 40 by 12 feet, or a doubles court 40 by 18 feet. The court is divided longitudinally by a net 4 feet 8 inches high, with neutral zones 3 feet wide paralleling the net on either side. The rings or grommets are of manila rope, or of sponge or inflated rubber, 6 inches in diameter, and must be tossed either underhand or horizontally. A point is scored by the server if the receiver fails to catch the ring and return it into the service court, or if he steps into the neutral zone. Feinting, stepping, or holding the ring is illegal. The server, standing behind the back line, is permitted but one service, and may continue to serve and score points until he fails to make a return, at which time the service goes over to his opponent. The game normally goes to 15 points, with two consecutive points required when the score is tied at 14 all. Deck tennis may be scored like lawn tennis, if desired.

DECLARATION, in common law pleading, is a statement of the facts constituting the plaintiff's cause of action; in the law of evidence, a statement made by a party to a transaction or by one who has some interest in it. Declarations are usually not admissible in evidence unless made at the time of the act to which they are related. The most notable exceptions to this rule are declarations of a dying person, called dying declarations, and declarations made against the speaker's interest.

Another declaration is that made in lieu of oath by persons who, because of religious scruples, for example, refuse to take the prescribed oath to tell the truth before giving testimony. Such a declaration is considered to have the same legal effect as an oath, and if the witness does not tell the truth he is guilty of perjury. Still another declaration is a declaration of intention, the statement of an alien that he intends to renounce citizenship of some other country and to acquire citizenship of the United States. It is a step in the process of naturalization and is popularly referred to as "first papers."

DECLARATION OF HUMAN RIGHTS, a covenant adopted by the United Nations General Assembly, December 10, 1948, designed to further international co-operation in promoting and encouraging respect for human rights. Many nations observe December 10 as Human Rights Day.

The declaration, which consisted of 30 articles, propounded certain inalienable rights of man in social, cultural, civil, personal, and economic fields. The assembly, in adopting the agreement, proclaimed the following rights as "a common standard of achievement for all peoples and all nations": the right to life, liberty, and security of person; to freedom of movement and residence; to social security; to work; to education; to nationality; to freedom of worship; to freedom of expression and of peaceful assembly; to take part in the government of one's own country; to hold public office; to seek and be granted asylum; and to own property.

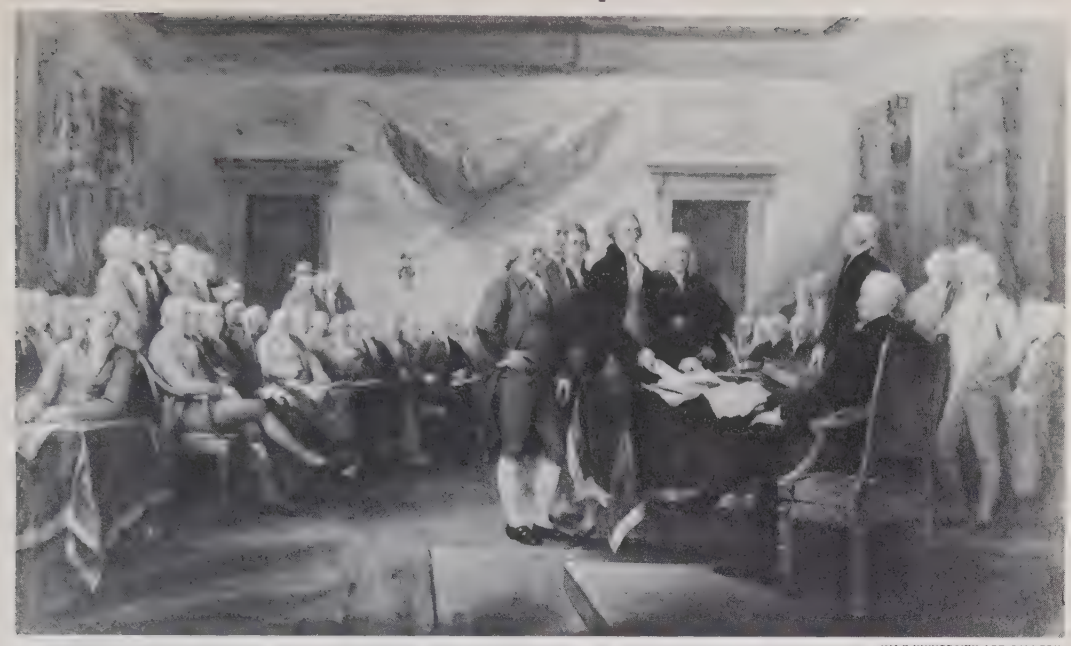
Supplemented with measures for its implementation, the Declaration was the basis for much subsequent legislation and adjudication by the member nations of the United Nations. It was regarded by many as a move toward the goal of an international bill of rights and a recognition of better international protection of racial and religious groups throughout the world. See United Nations; Civil Liberties and Rights; Bill of Rights; International Law; International Organization; Due Process of Law.

DECLARATION of INDEPENDENCE

Great document of American independence and statement of living principles of freedom

DECLARATION OF INDEPENDENCE, the historic document adopted by the Continental Congress July 4, 1776; the official engrossed copy was called "the Unanimous Declaration of the Thirteen United States of America." The purpose of the declaration was to support the resolution of independence adopted July 2, 1776. This formal action required some explanation and argument to persuade both Americans and those abroad of its justice and necessity.

Earlier in the contention with Great Britain, the colonists' demands had been for their rights as Englishmen under the British constitution and crown. Even after the actual clash at arms, the Congress still appealed for such rights to the king and to the British people. The development of the war and the



YALE UNIVERSITY ART GALLERY

The Declaration of Independence, a Painting by Trumbull

need for foreign support—less likely to be given to rebels than to an independent government—drove Americans toward an act of separation. The leaders of colonial opinion were moving in the same direction. Thomas Paine in *Common Sense* stressed the impossibility of reconciliation and the need for independent government; John and Samuel Adams urged it more subtly; meetings and gatherings passed resolutions favoring independence.

On May 15, 1776, the Virginia Convention, the revolutionary government of that colony, instructed its delegates in Congress to propose that the general body declare the states of America absolved from allegiance to the king and Great Britain. On June 7 Richard Henry Lee, speaking for the delegation, introduced the formal resolution: "That these United colonies are, and of right ought to be, free and independent states, that they are absolved from all allegiance to the British Crown, and that all political connection between them and Great Britain is, and ought to be, hereby dissolved." Although further action was postponed, the Congress on June 11 anticipating passage of the resolution, appointed a committee of five to draft a declaration of reasons for the action and named Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston to the committeee.

Drafting and Adoption. The actual task of drafting was given to Jefferson because of what Adams called "his peculiar felicity" as a writer. His draft, which apparently made use of material prepared for the Virginia Convention, was altered (mainly in phraseology) by Adams and Franklin and submitted to Congress by the full committee on June 28. After the passage of Lee's resolution on July 2, the Congress, sitting as a committee of the whole, took up this draft of the declaration. A number of changes were made in wording and some in substance; the most striking was the deletion of Jefferson's attack on the king for permitting and encouraging the institution of slavery. This, according to Jefferson's later account, was omitted out of deference to the opinion of southern states.

With these changes, the Congress adopted the document on July 4 as "A Declaration by the Representatives of the United States of America in Congress Assembled." The document became "the unanimous declaration" when the New York delegates, whose instructions had prevented their previous approval, were able to sign. The engrossed copy was signed on August 2, and on several later occasions. Of the 57 signers, seven were not members of the Congress on July 4. Seven who were members did not sign the document.

Sources and Analysis. After the opening statement of the necessity for such a justification, the declaration is almost syllogistic in form: the general principles of political philosophy underlying the change of government are stated; instances are listed to prove that these principles have application to the colonial situation; and the conclusion is drawn.

The general principles, the truths Jefferson held "self-evident," are the most quoted and most important paragraphs. Much analysis and argument has taken place concerning the exact meaning of these phrases and the sources of Jefferson's thought. He himself insisted that he only put into words the common thought of his time; in a document intended for action, not a philosophic treatise, originality and subtlety might have been disadvantages. The basic philosophy of natural rights, derived from God, belonging to men as men, and morally superior to the power of government, had roots deep in the Christian tradition. It came down to Jefferson in the doctrines of English law as well as in the writings of political philosophers, of whom John Locke was probably the most influential. The theory that government ought to be based on the consent of the governed was widely held. See Locke, John; Natural Law; Popular Sovereignty.

Jefferson in the declaration did not add to this philosophy but gave it a formulation so brief, clear, and impressive as to fix it in the minds of men for generations. The formulation had a double effect. Immediately it was the foundation for the American claim of justice in rebelling against the king. More deeply and permanently it afforded justification for revolution against tyranny, and for the establishment of democratic government in any age and place.

The bulk of the declaration is taken up with the list of "usurpations and abuses" which were the evidence that the rights of the colonists had been violated by the king and the English parliament, and that the colonists were therefore rightfully entitled to

THE UNANIMOUS DECLARATION OF THE THIRTEEN UNITED STATES OF AMERICA

When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that among these are Life, Liberty and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed. That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object, evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security. Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.

He has refused his Assent to Laws, the most wholesome and necessary for the public good.

He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

He has refused for a long time, after such dissolutions, to cause others to be elected, whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the meantime exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.

He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary Powers.

He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of New Offices, and sent hither swarms of Officers to harass our people, and eat out their substance.

He has kept among us, in times of peace, standing Armies without the Consent of our legislature.

He has affected to render the Military independent of and superior to the Civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:

For quartering large bodies of armed troops among us:

For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:

For cutting off our Trade with all parts of the world:

For imposing Taxes on us without our Consent:

For depriving us in many cases of the benefits of Trial by jury:

For transporting us beyond Seas to be tried for pretended offences:

For abolishing the free System of English Laws in a neighboring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:

For taking away our Charters, abolishing our most valuable Laws, and altering fundamentally the Forms of our Governments:

For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated Government here, by declaring us out of his Protection and waging War against us.

He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.

He has constrained our fellow Citizens taken captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.

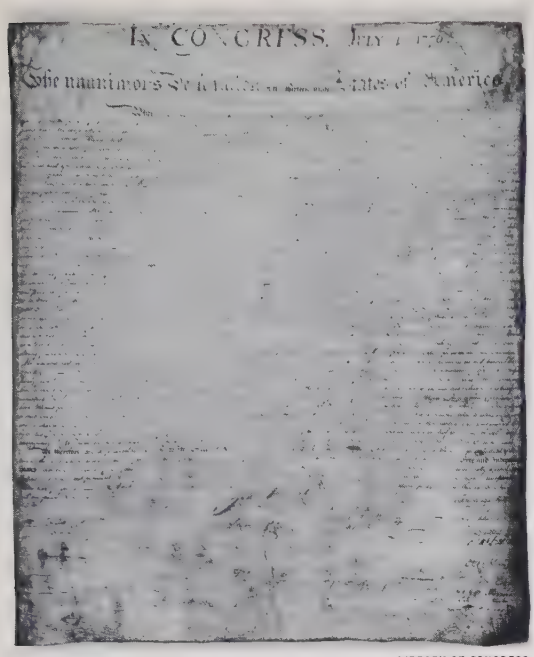
He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.

In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince, whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.

Nor have We been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

WE, THEREFORE, the REPRESENTATIVES of the UNITED STATES OF AMERICA, IN GENERAL CONGRESS, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by authority of the good People of these Colonies, solemnly PUBLISH and DECLARE, That these United Colonies are, and of Right ought to be FREE AND INDEPENDENT States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as FREE AND INDEPENDENT STATES, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which INDEPENDENT STATES may of right do. And for the support of this Declaration, with a firm reliance on the protection of Divine Providence, We mutually pledge to each other our Lives, our Fortunes, and our sacred Honor. [The signers are as follows:]

John Adams, Mass.
Samuel Adams, Mass.
Josiah Bartlett, N.H.
Carter Braxton, Va.
Charles Carroll, Md.
Samuel Chase, Md.
Abraham Clark, N.J.
George Clymer, Pa.
William Ellery, R.I.
William Floyd, N.Y.
Benjamin Franklin, Pa.
Elbridge Gerry, Mass.
Button Gwinnett, Ga.
Lyman Hall, Ga.
John Hancock, Mass.
Benjamin Harrison, Va.
John Hart, N.J.
Joseph Hewes, N.C.
Thomas Heyward, Jr., S.C.
William Hooper, N.C.
Stephen Hopkins, R.I.
Francis Hopkinson, N.J.
Samuel Huntington, Conn.
Thomas Jefferson, Va.
Richard Henry Lee, Va.
Francis Lightfoot Lee, Va.
Francis Lewis, N.Y.
Philip Livingston, N.Y.
Thomas Lynch, Jr., S.C.
Thomas McKean, Del.
Arthur Middleton, S.C.
Lewis Morris, N.Y.
Robert Morris, Pa.
John Morton, Pa.
Thomas Nelson, Jr., Va.
William Paca, Md.
Robert Treat Paine, Mass.
John Penn, N.C.
George Read, Del.
Caesar Rodney, Del.
George Ross, Pa.
Benjamin Rush, Pa.
Edward Rutledge, S.C.
Roger Sherman, Conn.
James Smith, Pa.
Richard Stockton, N.J.
Thomas Stone, Md.
George Taylor, Pa.
Matthew Thornton, N.H.
George Walton, Ga.
William Whipple, N.H.
William Williams, Conn.
James Wilson, Pa.
John Witherspoon, N.J.
Oliver Wolcott, Conn.
George Wythe, Va.



LIBRARY OF CONGRESS

Shown here is a 1950 photograph of the original engrossed and signed manuscript of the Declaration of Independence, now on display in the National Archives, Washington, D.C.

disavow these governmental agencies and set up new ones. Historians have not accepted the list as an entirely accurate description of the causes of the Revolution, or of the behavior of George III, but its effectiveness as an argument is undeniable.

The conclusion of the declaration is the formal resolution of independence already passed by the Congress. The reasoning is complete: people have the right to revolt and form a new government under certain circumstances; these are the circumstances of the American colonists; therefore they are, and of right ought to be, independent states.

Influence. By Washington's orders, the declaration was read to the army. Printed copies in broadside form spread throughout the United States and abroad. The resolution for independence, and the declaration, represented decision and encouraged hitherto uncertain colonists to join the movement. With the ground prepared by more than a year of fighting and longer agitation, the declaration was probably not necessary for the purpose of persuading, but it gave the colonists a clear-cut and effective statement of their cause.

Abroad the declaration was proof of the permanence of the colonists' intentions and constituted an appeal to enlightened opinion. The French and Spanish governments were unsympathetic to revolutionary appeals, and gave aid to the Americans from motives of policy. However, some influential circles, especially in France, were much affected, by the spectacle of a people building their own government on the principles of the philosophy of natural rights.

Although the Declaration of Independence neither at the time of its adoption nor in later United States history had any legal effect, it was still a state paper of unequaled impact. The day of its adoption was widely celebrated, and soon became the chief patriotic holiday of the new nation, with a reading of the document a standard feature of the festivities. See INDEPENDENCE DAY.

Moreover, the declaration became a touchstone of American political philosophy and practice. Its phrases have been frequently quoted by orators and its ideals regarded as the guideposts of American development. Opponents occasionally denied its doctrines, but through the nineteenth century such theoretical opposition was rare, except among some early Federalists and a body of Southern theorists and politicians before the Civil War, who noted the contradiction between the declaration and the existence of slavery, and so decided against the validity of the declaration.

The declaration became a major influence in the growth of democratic and revolutionary movements elsewhere in the world. Rarely, in continental Europe, were issues so clear or the intellectual justification of liberal or radical actions so simple as they had been in the American colonies in 1776, nor was it possible to distinguish the influence of the declaration itself from that of the successful American experiment. With whatever qualifications and limitations, there was still no doubt that the declaration was one of the foremost influences in moving the peoples of Europe on the eve of and during the nineteenth century, and the peoples of Asia and Africa in the twentieth century, toward national independence and democratic government.

The engrossed copy of the declaration, usually regarded as the official text, was repeatedly moved and considerably damaged by handling and by light until the Department of State placed it in a safe for protection from light. In 1921 it was given to the Library of Congress where a shrine in which it could be placed and viewed without damage was constructed. In 1951 a helium-filled case was devised to prevent further deterioration and in December 1952 the document was moved to the National Archives. See CONTINENTAL CONGRESS; REVOLUTION, AMERICAN; UNITED STATES HISTORY; DEMOCRACY; FREEDOM; LIBERTY. G. J. F.

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DECLARATION OF LONDON, an international convention drawn up in 1909, stating the rules of naval warfare; although not formally ratified it was regarded as an authoritative summary of existing principles of international law. The Hague Conference of 1907 had proposed an international prize court; the conference in London was to draw up an agreed interpretation of the law to be applied by this court. From Dec. 4, 1908, to Feb. 26, 1909, representatives of 10 nations discussed such matters as contraband, blockade, continuous voyage, destruction of neutral vessels, conversion of merchant ships to war vessels, transfer of flag, the nationality and domicile of owners of vessels, and the right of visitation of neutral ships. In general the nations differed because of their expected positions and interests in the event of war. They worked out agreed statements on all questions except conversion of merchant vessels and domicile, and agreed that the declaration, drawn up in 71 articles, should be regarded as an indivisible whole. The U.S. Senate ratified the convention but when Great Britain failed to approve it, Pres. William H. Taft withheld formal ratification; the ratification of other powers was similarly withheld. Although not ratified, the Declaration of London was still regarded as a standard for behavior, was applied in the war between Turkey and Italy in 1911, and was frequently cited and appealed to in World War I. In the latter conflict, however, its principles were often disregarded. See INTERNATIONAL LAW; WAR, LAW OF; NEUTRALITY; PRIZE OF WAR; CONTRABAND OF WAR.

DECLARATION OF PARIS, a statement of principles governing maritime war, signed at Paris Apr. 16, 1856. The representatives who drew up the peace settlement for the Crimean War decided also to deal with some of the conflict and uncertainty over naval war and neutral rights. The declaration announced four principles: (1) privateering was abolished; (2) a neutral flag would protect enemy goods except contraband of war from seizure; (3) with the same exception neutral goods, even on enemy ships, were safe; and (4) a blockade to be binding must be effective. Privateering, the practice of issuing permission to private citizens to raid enemy commerce, had long been under attack. (See PRIVATEERING.) The second and third principles had been urged by neutrals with the slogan, "free ships, free goods; free goods, always free." Signatories in the Crimean War settlement were Austria-Hungary, France, Great Britain, Prussia, Russia, Sardinia, and Turkey; within a year more than 40 other nations joined in the declaration. The United States did not sign, on the ground that the declaration did not go far enough and that protection should be afforded to all innocent private property. The United States, however, did observe the principles of the declaration in both the Civil War and the war with Spain. The rules of the declaration, although the source of considerable controversy, became an accepted part of international law, recognized by some courts during World War I. See also CONTRABAND OF WAR; BLOCKADE; INTERNATIONAL LAW; WAR, LAW OF; NEUTRALITY.

DECLARATION OF RIGHTS, a statement of the rights of a people and, ordinarily, a list of violations of those rights by an existing government. Notable examples were the declaration presented to William and Mary by the Convention Parliament in England, February 1689, also known as the Declaration of Right, which became the foundation of the English Bill of Rights; the Declaration of Rights, or of Rights and Grievances, presented to George III by the first Continental Congress in October 1774, asserting the rights of the American colonists as British subjects; and the proposals of the Virginia Convention in May 1776, the basis of the bill of rights in the Virginia constitution.

DECLARATION OF WAR. See WAR, LAW OF.

DECLARATORY ACT, an act passed by the parliament of Great Britain setting forth a principle of law or the constitution rather than new legislation. The most famous declaratory act was passed in March 1766, at the same time the Stamp Act was repealed. In answer to the claims of American colonists that only the colonial legislatures could tax them or legislate for them, this act asserted the full power of parliament and crown over the colonies in all cases, and declared null and void any colonial enactments denying or questioning the power of parliament. The act kept alive the constitutional claims of parliament and was a source of distrust in the colonies. A similar declaratory act in 1719 had asserted the right of the British parliament to legislate for Ireland.

DECLINATION. See ASTRONOMY, *Celestial Sphere: Circles and Coordinates;* COORDINATE, CELESTIAL.

DECOMPRESSION CHAMBER, an airtight room from which air can be pumped to reduce the pressure inside below the normal atmospheric level. It is used generally by the armed forces to test the physiological and psychological reactions of trainees to reduced air pressures corresponding to those encountered in high-altitude flight and also to train them in the use of oxygen equipment. Many such chambers have refrigeration equipment so that both factors of upper-air environment—reduced pressure and low temperature—can be present at the same time.

Military decompression chambers are usually of steel or reinforced concrete and cylindrical to minimize the pressured area. Diameters vary from 10 to 15 feet or more, with floors wide enough to accommodate a row of trainees on either side and an aisle wide enough for instructors and technicians to walk about. Oxygen masks and accessory equipment are installed, as are instruments used in high-altitude flight. Glass observation ports are set into the walls at intervals, and there are often small air locks for passing materials in or out. A large air lock at the entrance enables men to pass in and out without affecting the low pressure in the chamber itself. If a trainee shows dangerous symptoms under low air pressure he can be taken quickly into the air lock and subjected to normal pressure. Similar chambers called compression chambers are used in diving and caisson work to "recompress" workmen who have left a high-pressure work area too rapidly. The pressure is then lowered gradually to atmospheric. See AIR LOCK; AVIATION MEDICINE; CAISSON; DECOMPRESSION SICKNESS; DIVING.

USAF

A subject is checked for hypoxia (oxygen deficiency) after removal of his oxygen mask in an altitude chamber at the School of Aviation Medicine, Randolph Air Force Base, Tex.

DECOMPRESSION SICKNESS, a condition that results from a drop in barometric pressure so rapid that gases dissolved in the blood and tissue fluids are released as bubbles. All of the symptoms are the results of the interference of these bubbles with normal body processes. Various names are applied to this condition, depending upon the kind of work being done at the time it is encountered or upon the parts of the body affected. Caisson disease (which occurs in caisson workers), diver's paralysis (which occurs in deep-sea divers), and the decompression sickness of aviators are all produced by the same mechanism. See CAISSON.

Diver's Paralysis and Caisson Disease. When a deep-sea diver or caisson worker ascends rapidly to sea level, thus exposing himself to a rapidly lowered barometric pressure, bubbles of nitrogen appear in the blood stream and tissues. Some of these bubbles lodge in tissues of the limbs and others in the small blood vessels in the spinal cord, blocking the circulation to the nerve cells, which then cease to function and induce paralysis and pain. The resulting "bends" are so called from the contorted bodies of divers so afflicted. Respiratory symptoms of choking, a feeling of oppression, and the inability to take a deep breath have given rise to the term "chokes."

Altitude Decompression Sickness. In aviators the most common symptoms are those of the bends; second most common are the symptoms of chokes. Less frequent are neurological symptoms such as paralysis and inability to see clearly. Least common are collapse reactions, which are extremely serious

but fortunately rare. The symptoms usually become evident at heights of 30,000 feet or more, but may appear at altitudes of 2000 feet. They may be brought on more quickly or aggravated by exercise. Since the cure is increase in barometric pressure, it can be accomplished quite simply by descent to lower altitudes. See AVIATION MEDICINE.

Cause. The key to the mechanism of decompression sickness is the solubility of gases in liquids. The pressure of gas dissolved in a liquid will equal the pressure of the gas to which the liquid is exposed. A similar situation exists in the body, where the gas is the air in the lung capillaries; oxygen passes into the blood because its pressure in the lungs is higher than that in the venous blood coming into the lungs (see ANOXIA). Nitrogen, another gas present in the air in the lungs, also passes into the blood, but because nitrogen is not used in the body there is usually very little difference between its concentration in arterial blood and venous blood. However, the principal offender in decompression sickness is nitrogen. It has the greatest pressure of all of the dissolved gases; furthermore, it is transported in the blood only in solution, whereas oxygen and carbon dioxide are carried not only in solution but also in loose combination with hemoglobin. See BLOOD.

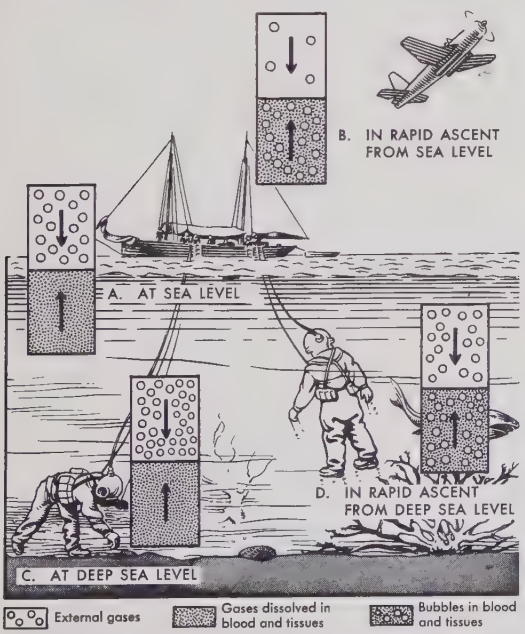
The pressures of the gases in arterial blood at sea level are, in millimeters of mercury (mm Hg):

OXYGEN	103
NITROGEN	570
CARBON DIOXIDE	40
WATER VAPOR	47
	760

It will be noted that the total of these pressures equals the barometric pressure at sea level.

The pressures of these gases in the tissues is very similar to the pressures in blood.

If, for example, an aviator suddenly climbs to an altitude of about 33,000 feet where the barometric pressure is only one-fourth that at sea level the dissolved gases will come out of solution as bubbles of gas. This is comparable to the bubbling of a carbonated beverage when the bottle is opened. When the beverage is made, carbon dioxide is dissolved in the liquid at a pressure greater than atmospheric pressure, and a tight-fitting cap is placed on the bottle to maintain the pressure. When the cap is removed the pressure is reduced to atmospheric pressure and the carbon dioxide escapes from the liquid as bubbles. The pressure of the air breathed increases one atmosphere (760 mm Hg) for each 32 feet of depth, hence, the gases in the body are then dissolved at these new increased pressures. Consequently when the diver or caisson worker ascends very rapidly to the surface, the dissolved gases come out of solution as bubbles, just as in the carbonated beverage when bubbles appear as the liquid is exposed to lower atmospheric pressure.


B. IN RAPID ASCENT FROM SEA LEVEL
A. AT SEA LEVEL
D. IN RAPID ASCENT FROM DEEP SEA LEVEL
C. AT DEEP SEA LEVEL
External gases
Gases dissolved in blood and tissues
Bubbles in blood and tissues

Decompression sickness occurs during rapid passage from a higher to a lower pressure and dissolved gases form bubbles in the blood and tissues. Altitude decompression sickness is caused by ascent from sea level (*A* to *B*), and caisson disease by ascent from deep sea levels (*C* to *D*).

Prevention. Decompression sickness can be prevented if the change to a lower barometric pressure is made slowly enough to allow time for the excess gases to be eliminated through the lungs. If the barometric pressure is lowered only a few mm of Hg, the excess of nitrogen in the venous blood will pass across the lung membrane to the air in the lungs and be eliminated on expiration. The nitrogen pressure in the arterial blood will thus be lowered. Since the nitrogen pressure in the tissues will be higher than that in the arterial blood, nitrogen will pass into the blood from the tissues when the arterial blood reaches the tissue capillaries, and the cycle will then be repeated until the pressure of nitrogen in the tissues is the same as that in the blood and in the air in the lungs. See AIR LOCK.

HERMAN S. WIGODSKY, M.D.

DECORAH, city, NE Iowa, county seat of Winneshiek County, on the Upper Iowa River, the Milwaukee and the Rock Island railroads, and U.S. Highway 52; 71 miles ENE of Mason City. Decorah is located in a scenic region of wooded hills and sheer river bluffs. Easterners founded the city in 1849 and named it for Chief Waukon Decorah, who aided the white men during the Black Hawk War. Many Norwegians settled here. The city is the seat of Luther College, founded in 1861; in 1933 the college opened the Norwegian-American Historical Museum which houses an extensive collection of relics brought from Norway. Decorah is an agricultural trading center and also produces dairy products and feed and has machine shops. It is the site of a state fish hatchery. Fort Atkinson State Park is located about 12 miles SW of the city. Pop. (1950) 6060.

DECORATION, a citation or honor publicly bestowed on a person who has performed some special act of bravery in war or peace, or on one whose work has especially benefited the public. The unselfish character of such acts is usually regarded as paramount and above financial reward. In many cases promotions in rank have been given persons decorated for acts of military bravery which occasioned the saving of lives or a gain of military advantage.

The wearing of medals indicating the performance of a special military service is said to have been practiced by the Chinese in the first century but was not common in Europe until the seventeenth century. The use of badges and significant emblems as evidences of military service or prowess is much older, and was practiced by the Roman army.

UNITED STATES

Medals and badges awarded to officers and men of the U.S. armed forces (and in some cases to civilians) are, in order of rank:

Medal of Honor, the highest decoration, given by the president in the name of Congress to any member of the armed forces who, in conflict with an armed enemy, distinguishes himself by extraordinary bravery at the risk of his own life. See CONGRESSIONAL MEDAL OF HONOR.

Distinguished Service Cross, authorized in 1918, a bronze cross awarded by the president to any member of the armed forces or to a civilian who distinguishes himself by extraordinary heroism in operations against an armed enemy. The navy

award, given under the same conditions and known as the Navy Cross, bears crossed anchors and is hung from a blue ribbon with a white stripe down the center. The army award is decorated with an eagle and is attached to a blue ribbon edged in red and white.

Distinguished Service Medal, authorized in 1918, awarded to any member of the armed forces or to a civilian who distinguishes himself by exceptionally meritorious service to the government in time of war or in connection with armed operations against the enemy.

Silver Star, authorized in 1942, awarded to officers and men of the armed forces or to a civilian for gallantry in action or heroism.

Legion of Merit, authorized in 1942, awarded for exceptionally meritorious acts in furtherance of the war effort. Military personnel of the United States and of allied foreign nations are eligible. The award consists of four degrees: Chief, Commander, Officer, and Legionnaire. The medal is a five-pointed star of white enamel, attached to a maroon ribbon. The Medal of Merit is awarded to civilians for similar services.

Distinguished Flying Cross, authorized in 1928, awarded for extraordinary heroism or achievement while on an aerial mission.

Bronze Star Medal, authorized in 1942, an award similar to the Silver Star but in lower degree. It is given for heroic acts or outstanding service in connection with military operations against the enemy. Personnel of all services, as well as civilians, are eligible.

Air Medal, authorized in 1942, given for heroism in air missions. Aviation personnel of all branches of the service may receive the medal, which may also be awarded to civilians.

Commendation Ribbon (Army), awarded to any member of the armed forces serving in any capacity with the army who performs meritorious service not in sustained operations against an enemy.

Commendation Ribbon (Navy) may be worn by any naval personnel who have received a letter of commendation.

Purple Heart, normally awarded to men who have been wounded in action, was the first U.S. decoration ever presented to army enlisted men. Established by George Washington in 1782, it was revived by act of Congress in 1932. See PURPLE HEART, ORDER OF THE.

Distinguished Unit Badge (Army), may be worn by members of any unit that has been especially cited by the president.

Presidential Unit Citation (Navy), may be worn by members of any naval unit that has been especially cited by the president.

Good Conduct Medal, presented to enlisted men in all branches of the service in recognition of efficiency, good behavior, and loyalty.

Oak Leaf Cluster. For a succeeding accomplishment sufficient to justify award of any of the major decorations, a bronze oak leaf cluster is awarded to be worn on suspension ribbons and in miniature on service ribbons. After five similar awards a silver oak leaf cluster is authorized. In the navy gold stars are used to symbolize additional awards.

Ribbons made of the same material as that from which the medal is suspended are usually worn in lieu of the medals themselves.

Service Medals are awarded from time to time to members of the armed forces who have taken part in battles, operations, or wars in which the United States was engaged. The first service medal was authorized in 1905. Some of the more important ones include: Civil War Campaign Medal, Indian Campaign Medal, Spanish Campaign Medal, Spanish War Service Medal (for those not eligible for the campaign medal), Army of Cuban Occupation Medal, 1898–1902, Army of Puerto Rican Occupation Medal, Aug. 14–Dec. 10, 1898, Philippine Medal, 1899–1913, Philippine Congressional Medal, China Campaign Medal, Army of Cuban Pacification Medal, Mexican Service Medal, Mexican Border Service Medal, Nicaraguan Campaign Medal, 1912, Haitian Campaign Medal, 1915, Dominican Campaign Medal, 1916, Navy Expeditionary Medal, Marine Corps Expeditionary Medal, Victory Medal (World War I), Army of Occupation of Germany, 1918–23, Haitian Campaign Medal, 1919–20, Second Nicaraguan Campaign Medal, 1926–33, Yangtze Service Medal, 1930, China Service Medal, 1937–39, American Defense Service Medal, 1939–41, American Campaign, 1941–45, European-African-Middle Eastern Campaign, Asiatic-Pacific Campaign, World War II Victory Medal, Army of Occupation Medal (World War II).

Other medals include the Women's Army Corps Service Medal (awarded for service in both the Women's Army Auxiliary Corps and the Women's Army Corps, 1942–45), and the Medal for Humane Action (awarded for service of at least 120 days during the Berlin airlift, June 26, 1948–Sept. 30, 1949).

On Nov. 8, 1950, the Korean Service Medal was authorized for members of the armed forces who served in military operations in the Korean theater after June 27, 1950.

Various badges are awarded in recognition of attaining a high standard of proficiency in certain critical military skills. Some of these are: the Combat Infantryman Badge, Expert Infantryman Badge, Medical Badge, Parachutist Badge, Glider Badge, Divers' Badges, and Army Aviator Badge. There is no established precedence among badges as there is with decorations and medals, or ribbons.

Only by special act of Congress may officers and enlisted men accept medals or decorations conferred by foreign powers. If the necessary authorization is given to wear foreign decorations, at least one U.S. decoration must be worn at the same time as the foreign award.

Military regulations prescribe the following precedence in the wearing of ribbons: first, U.S. decorations; then U.S. service medals, followed by foreign decorations and foreign service medals.

A number of commemorative medals have been awarded: Dewey Medal, 1898, Sampson Medal, 1898, NC-4 Medal, 1919, Byrd Antarctic Expedition Medal, 1928–30, Second Byrd Expedition Medal, 1933–35, Cárdenas Medal of Honor, 1898, Peary Polar Expedition, 1908–09.

OTHER COUNTRIES

Great Britain. Recognition of several kinds for meritorious service is given in Great Britain: (a) advanced rank, (b) elevation to the peerage, (c) membership in an order of knighthood, (d) membership in a military order, (e) presentation of a medal for conspicuous bravery in action, (f) medal for gallantry in action, (g) medal for service against the enemy in a particular battle or campaign. All except the first two involve the wearing of medals (including crosses and stars). The Victoria Cross, instituted in 1856, is given to any officer or enlisted man who performs an act of bravery or devotion to his country in the presence of the enemy. (See VICTORIA CROSS.) The George Cross, instituted in 1940, is awarded primarily to civilians for acts of the greatest heroism or conspicuous courage in circumstances of extreme danger, or to members of the armed forces for acts for which military honors are not normally awarded. The George Cross was given the island of Malta in 1942. The Distinguished Service Order (D.S.O.) is a military order, instituted in 1886 for officers, membership in which is given for individual instances of meritorious or distinguished service in war; the medal is in the form of a white and gold cross with a red center. The Distinguished Service Cross (D.S.C.) is awarded for acts of gallantry by officers and warrant

officers of the Royal Navy, while the Military Cross (M.C.) is awarded to captains, lieutenants, and warrant officers of the army; both were instituted in 1914. The Distinguished Flying Cross (D.F.C.), instituted in 1918, is awarded to officers and warrant officers of the Royal Air Force and the Fleet Air Arm. There are a number of other decorations, including medals for a battle, a campaign, or a war.

France. The most distinguished decoration is the Legion of Honor, established by Napoleon I. It may be given for any kind of distinguished service. See Legion of Honor. The Médaille Militaire is given to foreign officers, and for gallantry to French noncommissioned officers and enlisted men. The Croix de Guerre is awarded all ranks. See Croix de Guerre.

Russia. The Order of Lenin, instituted in 1931, is awarded to men of the army and navy, to civilians, and to organizations and institutions for outstanding achievements. A hero of the Soviet Union is awarded the Order of Lenin and the Gold Star Medal. The Order of Victory is the highest military decoration awarded to army officers for decisive operations. The Order of Suvarov and the Order of Kutuzov are awarded to commanding officers of units for meritorious services in the field; the Order of Alexander Nevsky to army officers, for valor and leadership; the Order of Bogdan Khmelnitsky to officers and enlisted men of the army and navy and to guerrillas for distinguished service in battles for liberation of Soviet territory. Other awards include the Order of Glory, the Order of the Red Banner, the Order of the Patriotic War, the Order of the Red Star, and the Medal for Valor.

Naval awards include the Order of Nakhimov for repulsing the enemy without loss to Russian forces; the Order of Ushakov, the Medal of Ushakov, and the Medal of Nakhimov for success against a numerically superior enemy. The Hammer and Sickle Medal is awarded with the Order of Lenin to a "Hero of Socialist Labor." The Order of the Red Banner of Labor is for achievement in production, science, or public service; the Badge of Honor is for high production records, scientific and cultural achievements, and inventions. The Partisan of the Patriotic War Medal is awarded for valor and fortitude in guerrilla warfare, the Distinguished Service Medal for army men or civilians aiding in military operations. A number of medals were awarded for military and civilian participants in specific operations such as the defense or capture of cities.

Germany. The Iron Cross, established in Prussia in 1813, consists of a Maltese cross of iron edged with silver. There are three classes: Grand Cross of the Iron Cross, of double size, was awarded for conspicuous services which had a decisive influence during combat; Iron Cross, Class I; and Iron Cross, Class II. During World War I the cross had the Kaiser's "W" surmounted by a crown in the center of the cross; in World War II a swastika was substituted. The date of award appears below the design. Iron Crosses of the last two classes were freely bestowed in World War I. The Prussian order Pour le Mérite, instituted 1667, was a noted military and civil distinction. German armed forces struck a number of special medals in World Wars I and II, for such events as the advance on Paris in 1914, the Anschluss with Austria, 1938, the Sudeten and Memel occupations, and the Narvik operation of 1940.

Other European Countries. Important Belgian medals include the Croix de Guerre, established in 1915, for exceptional acts of valor; the Military Cross, instituted in 1885; and the Medal of King Albert and that of Queen Elisabeth, for women, both instituted during World War I. In the Netherlands, in addition to the older orders of Willem I and the Netherlands Lion, established in 1815, the Bronze Cross and the Cross for Good Service were instituted in 1940 and 1941. In Poland the order of Polonia Restituta was established in 1921 for bravery, and for services in the arts and sciences. Yugoslavia's highest decoration is the Order of National Hero of Yugoslavia, instituted in 1942.

Latin America. Among the American republics some notable decorations are: the National Order of the Condor of the Andes, established in 1925 in Bolivia; the Chilean Order of Merit, instituted in 1910; the Order of Military Merit in Cuba, which replaced a decoration known as the Medal of Merit in 1912; and the Order of Merit in Ecuador, for both military and civil services, established in 1921. Others are the medal of La Solidaridad, founded in 1919 in Panama; the National Order of Merit in Paraguay, established by President López in 1865; the Order of the Sun in Peru, founded in 1821 by José de San Martín, and re-established in 1921; and the Order of the Bust of Bolívar in Venezuela, established in 1854. See also Medal; Knighthood.

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DECORATION DAY, or Memorial Day, observed May 30 in many states of the United States to commemorate members of the armed forces who gave their lives in the nation's wars. The day is marked by parades, patriotic meetings and oratory, and the decoration of graves of service personnel, usually under sponsorship of veterans' organizations.

The formal observance of Decoration Day began in 1868 when Gen. John A. Logan, commander in chief of the Grand Army of the Republic, named May 30 for decorating the graves of men killed in the Civil War. New York made the date a legal holiday in 1873; Rhode Island, 1874; Vermont, 1876; New Hampshire, 1877; Wisconsin, 1879; Massachusetts and Ohio, 1881. It is a legal holiday in most northern states. Most southern states commemorate war dead on Confederate Memorial Day.

DECORATIVE ARTS, sometimes called the minor arts to distinguish them from the fine arts of painting and sculpture, are concerned with the decoration of utilitarian objects to render them more pleasing to the eye. Decorative arts are distinct from design in that their application presupposes the existence of a designed object. In actual practice, however, the design of an object and its decorative aspects may be so integrated as to be inseparable except conceptually (see Design).

The decorations used by early man (on his shelters, his tools, and himself) were of magical or religious significance. One could ward off evil spirits by carving ominous-looking creatures on the doorposts of one's home; the symbolic carving of a deer on the shaft of a spear would help speed the weapon to its target—the deer. In later eras, such as the Egyptian, sacred motifs were used in decorating pottery, furniture, and textiles; these were subsequently employed simply because they made the objects look better and more desirable than unadorned ones. The Egyptians, who are credited with the creation of many of the decorative processes, developed definite design motifs such as stylized forms of the lotus, papyrus, waves, beetles, asps, and other animals.

Greek decoration probably had a greater influence on succeeding periods than that of any other culture. Greek decorative motifs include geometric borders, scrolls, the stylized acanthus, the honeysuckle, and others; Greek design was also influential.

The early Christians discarded the pomp and extravagance of the Romans; early Christian decorative

DECORATIVE ARTS

METROPOLITAN MUS. OF ART

This seventeenth century Persian plate, above, is typical of the ware that was made and decorated by untutored artists in small potteries.

ART INST. OF CHICAGO

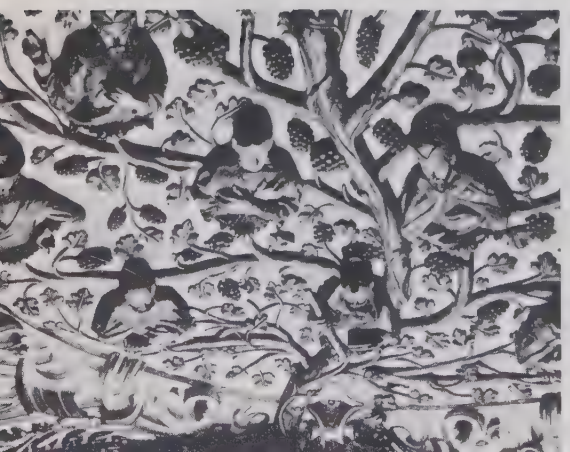
An Athenian hydria or water jar, above, dates from about 450 B.C. The figures and other ornamentation are red on a black background glaze.

The band leader, below, about 1750, is a Meissen figurine, typical of the best early work in the field. Chinese art may have been an influence.

ART INST. OF CHICAGO

METROPOLITAN MUS. OF ART

An example of the famed French tapestries is *The Hunt of the Unicorn*, made for the Château of Verteuil during the late fifteenth century.



Ceiling detail from the church of Santo Domingo at Oaxaca, Mex., showing a gold tree and figures of the saints.

AARON SISKIND

arts were marked by austerity. During the Middle Ages most creative effort in the decorative arts centered around the church, for which beautiful stained glass windows, stone and wood carvings, and fine fabrics for altar hangings and vestments were produced. The Renaissance which subsequently spread over western Europe brought a reaction to the stiff and formal Gothic period. Elaborate carving, richness of materials, and profuse ornamentation were characteristic of this period. Greek and Roman motifs with freer forms of flowers, fruit, vines, ribbons, vases, and human and animal figures were much used and abused. The great Italian artists of the time were also master craftsmen and produced distinguished pieces of decorative art. One of the best known of these was Benvenuto Cellini, who won great fame for his work in fine metals, especially gold and silver. Ornamental ironwork was used for many articles of utility and beauty, and for such decorative adjuncts to buildings as hinges, locks, and brackets. Expert weavers produced brocades, velvets, and damasks. Tapestry weaving flourished in Italy, Spain, and France, as did decorative processes such as glass blowing, pottery glazing, enameling, lacquering, ornamental leatherworking, and embroidery.

In other parts of the world the decorative arts also reached great heights of perfection. Persia and other countries of the Near East produced pottery of beautiful design and color, magnificent rugs and carpets, and fine brasses. The Chinese discovered the secret of making porcelain and during the fourteenth and fifteenth centuries produced some of the finest pieces the world has seen.

During and after the eighteenth century, workshops for specialized products became famous. Some of these were the Gobelin tapestry workrooms and the Dresden, Wedgwood, and Copenhagen porcelain factories. With the introduction of machinery and mass production in the nineteenth century, the entire character of the decorative arts changed. In the early years of the machine age the decorative arts regressed. Furniture and other commercial articles were loaded with cheap machine-made ornaments. William Morris attempted to revive the idea of the artist-craftsman in England in the latter half of the nineteenth century and produced some fine stained glass and textiles; but he was an exception to the rule. By the beginning of the twentieth century a new trend in design was started and the term "industrial arts" was more widely used than decorative arts. The use of machines and the constantly increasing choice of tools, materials, and processes brought about a definite shift from emphasis on decoration to emphasis on form and function.

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DECREE, the decision or determination of the rights of the parties to an action or proceeding in courts of equity, admiralty, and probate. This includes an award of proper relief. The decree of a court of equity corresponds to a judgment of a court of law, but differs in the matter of the relief awarded. A judgment must be for a sum of money or to dismiss a pleading, and must be in favor of one party as against the other, without any other provisions. However, a decree may afford relief according to the equities of the case. For example, if a court of equity decrees the cancellation of a written instrument for fraud, it usually requires the plaintiff to return what he has received from the defendant; the decree in such a case would provide that the instrument should be canceled upon payment of the consideration theretofore received. A decree of a court of equity may be either interlocutory or final. It is interlocutory when it merely disposes of a part of the matters at issue or leaves something more than the mere ministerial execution of the court's orders to be done. For example, an interlocutory decree may be entered in a divorce action, granting the divorce and leaving open the question of the custody of children, or of alimony, to be disposed of in a final decree. It is final when it includes a complete determination of the matter in controversy upon all the facts. Under some codes a judgment is a decision of a court in the exercise of equitable jurisdiction, as well as in law, but the distinction remains. See COMMON LAW; EQUITY; JUDGMENT.

DEDEAGACH. See ALEXANDROUPOLIS.

DEDHAM, town, E central Massachusetts, county seat of Norfolk County, on the Charles River, on the New York, New Haven, and Hartford Railroad and U.S. Highway 1; 9 miles SW of central Boston, of which it is a residential suburb. Dedham's industries include paper goods manufacturing and printing. The city, settled in 1635, was known for many years as Contentment. Fairbanks house, built in 1636, is one of the oldest frame houses in the United States. Pop. (1950)18,487.

DE DIEGO, JULIO, 1900– , U.S. painter, was born in Madrid, Spain, where he was apprenticed to theatrical scene painters; apart from this experience he was entirely self-taught. He came to the United States in 1924 and soon began to show his work in annual one man exhibits. De Diego's painting, a happy combination of classic technique and contemporary subject matter, is particularly noteworthy for its deep, glowing color and interesting spatial composition. His paintings are included in the permanent collections of numerous American and foreign museums.

DE DONIS, STATUTE, an act of the English parliament (Statute Westminster II, 13 Edw. I, c. 1, 1285) designed to prevent those who had only a partial interest in an estate from alienating the whole and defeating the interest of those who were subsequently to take. Its fuller title is *De Donis Conditionalibus* (concerning conditional gifts). Prior to this statute the courts had held that if an estate was granted to a man and the heirs of his body, he obtained a conditional fee, so that as soon as he had issue he could sell the land, and thereby disinherit the heirs of entail. These estates, on the happening of the condition—the birth of heirs—differed from ordinary estates in fee simple only in the restrictions named in the grant as to which class of heirs should take. The statute De Donis converted conditional estates into estates tail, which descended to the heirs, thus preventing alienation. This statute was the origin of the estate in fee tail and introduced perpetuities to build up landed estates. But anything tending to prevent alienation of land has always been repugnant to the general sense of the community in England, and the statute was soon evaded by what were called warranties: a man's heirs were held bound to warrant a grant made by their ancestor. See PERPETUITY; FINE.

DEDUCTION, a method of reasoning in which particular hypothetical conclusions, consequences, or facts are held to be necessarily valid by reason of a general principle or law which is held to be true, either as a permissible hypothesis for the sake of convenience in investigation or for the sake of argument, or as what is supposed to have been previously established as being unassailably true.

Deduction is commonly contrasted with *induction*, a method of reasoning in which a law or principle is

abstracted from a body of supposedly accurate data. Theoretically deduction and induction are thought to be exactly opposite methods (see INDUCTION). The syllogism is deduction in its most abstract and artificial form (see SYLLOGISM). The classic example is:

Major Premise: All men are mortal.
Minor Premise: Socrates is a man.
Conclusion: Socrates is mortal.

Even if it is assumed that deduction is a process of logic that can be performed without reference to other thought processes, it is evident that most deductions are less formally rigid and less exact than those which lend themselves to syllogistic statement. Modern logicians do not regard deduction and induction as contrasting methods; rather, each is a part of and involved in the other. See LOGIC, *Logic and Syllogisms* and *Deduction and Induction.*

DEED, a legal instrument in writing under seal, binding by its terms one or more parties to some obligation, or transferring property, and made complete and effective by delivery by the party bound thereby. In its broadest sense it includes formal contracts, bonds, and other specialties, but today it is almost exclusively conveyances of interests in real estate. Deeds are divided into two classifications: indentures and deeds poll. Strictly defined, an indenture is a deed between two or more persons having different interests, each being bound to some obligation by its provisions. The name was derived from the practice of writing out such an instrument in duplicate on the same piece of parchment, and then cutting it in half by an "indented" or notched line, thus separating the two parts, and rendering them capable of identification later by fitting the indented edges together. This practice has fallen into disuse but the name has been retained and is often inaccurately applied to conveyances of property which are properly deeds poll. A deed poll is a single instrument under seal binding only one party or several parties having the same interests. Under the old forms of conveyancing there were deeds "of bargain and sale"; deeds containing "covenants to stand seized"; and deeds of "lease and release," because of certain technical rules as to the transfer of property. At present ordinary deeds of bargain and sale or grant without any technical expressions are sufficient. A deed may contain certain covenants relating to the property and a warranty of title for the benefit of the grantee, and in such case it is commonly known as a "full covenant and warranty deed." If it merely purports to release whatever interest the party executing it may have, and contains no covenants or warranty, it is called a "quitclaim deed." Both forms are in constant use.

Although a deed is not required by law to be expressed in any particular language, it should contain certain formal parts clearly set forth. These essentials are: the names of the parties; a mention of consideration, although the exact amount or nature need not be named; a *habendum* clause, usually commencing "to have and to hold," and containing a description of the property and a statement of the exact interest therein conveyed; and a mention of a proper execution on a certain date and delivery. It may contain restrictions, covenants, and a warranty of title. The restrictions may be almost anything that the parties agree upon, for example, that no liquor be sold upon the premises. The following covenants are usually inserted in deeds of real property: against encumbrances, that is, that there are no liens or mortgages against the property except such as are mentioned therein; that the grantor has a good right to convey; covenant of "further assurance," that is, that the grantor will execute any further instrument to perfect the title which the grantee may reasonably require of him in the future; quiet enjoyment, that is, that the grantee will not be molested in his possession by the grantor or any one claiming under him; and covenant of seizure or ownership. If any of these be broken either at the inception of the deed, such as a covenant against encumbrances when liens against the property exist, or later, the grantee has an action against the grantor for damages. A warranty may be against any one claiming under or through the grantor or against all persons; the latter is the more common. A person executing a quitclaim deed undertakes no responsibility as to title or of any other nature; the grantee assumes all risks.

In most of the United States, deeds must be under seal, and witnessed or acknowledged before a proper officer, as a notary public or, if the deed transfers land outside the state in which it is executed, a commissioner of deeds. The seal may be a wafer, indentation, or mere scroll executed with the pen. A delivery to the grantee or some one representing him is essential to make a deed operative. Recording is not essential to the validity of a deed, but is necessary for the protection of the grantee against subsequent innocent purchasers for value.

A common use of the deed is to convey real estate to a trustee, a *deed of trust* or *trust deed.* These deeds are of two principal types—one creates an *absolute* trust and the other is in the nature of a mortgage. In the former the conveyance is to a trustee who holds the legal title for the benefit of a beneficiary, the grantor parting with the title unconditionally. In the latter the title is conveyed to the trustee as security for the payment of a debt with the condition that it shall become void when the debt is paid as provided and with the power in the trustee to sell the land and pay the debt in case of the default of the debtor. It is the practice in a number of states to secure loans by trust deeds rather than by mortgages. See CONVEYANCING; ESCROW; REAL PROPERTY; ABSTRACT OF TITLE; TORRENS SYSTEM.

DEEP, a depression on the ocean floor that measures more than 3000 fathoms, or 18,000 feet, below the water surface. The ocean floor resembles the surface of the land areas; it has mountains, plateaus, basins, canyons, and other physical features. Deeps are found in trenches or troughs that resemble canyons. The trenches are attributed to diastrophism, or dislocation of the earth's crust, and should be distinguished from the more numerous submarine canyons, much shallower depressions usually found near the continental shelves. Deeps and their associated trenches are usually found parallel to mountain ranges that may appear as the rim of a continent, islands in the ocean, or as shallows. The trenches are sounded either by long cables with weights on the end or by echo sounding, which works on the same principle as the seismograph. More than 100 deeps have been located, although large areas of the ocean floor are yet to be explored. The accompanying table lists a few of the noted deeps.

NOTED DEEPS

Name	Ocean or sea	Latitude	Longitude	Depth in feet
Challenger	Pacific	11°19′N	142°15′E	35,640
Horizon	Pacific	23°16′S	174°46′W	34,884
Galathea	Pacific	10°27′N	126°36′E	34,578
Ramapo	Pacific	30°30′N	142°30′E	34,038
Milwaukee	Atlantic	19°36′N	68°20′W	30,246
Meteor	Atlantic	55°25′S	26°40′W	27,114
Bartholomew	Pacific	23°30′S	71°30′W	25,980
Java Trench	Indian	10°20′S	110°30′E	24,440
Bartlett	Caribbean	19°10′N	79°50′W	22,788

Deeps are generally named for the ships that made the soundings, trenches for the adjacent land areas. See also ABYSSAL ANIMALS; CHALLENGER EXPEDITION; OCEAN; DIASTROPHISM.

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DEEP-SEA ANIMALS. See Abyssal Animals; Zoogeography, *Biomes;* Blindfishes.

DEEP-SEA EXPLORATION. See Challenger Expedition; Oceanography; Bathysphere.

DEEP-SEA FISHING. See Fishing.

DEER, a large group of even-toed, hoofed animals belonging to the family *Cervidae.* Deer are ruminants (see Ruminant) and range in size from the Chilean pudu, about a foot in height to the 6-foot moose (see Moose) that may weigh 1400 pounds. The male of most species is distinguished by various types of antlers (see Antler) that are shed and regrown each year. Both sexes of some species bear antlers; other species bear none. Deer are widely distributed in all types of habitats throughout the world except Australia, Madagascar, and African regions south of the Sahara Desert. The axis deer, found in India, is reddish brown with profuse white spots and is considered one of the most beautiful members of the deer family. The fallow deer, native to the Mediterranean but found in a semidomestic state in European parks, is distinguished by the flattened palmate antlers of the stag. The muntjac, also called the barking deer because of its sharp doglike bark, is a small oriental deer with tusklike upper canine teeth in the male. The mule deer of western North America is distinguished by its large ears. The musk deer of central Asia, the most primitive of living deer, is hunted for its musk gland which is used for making perfume. (See Musk; Musk Gland.) The lordly red deer, found in the temperate regions of Europe and Asia, has an impressive crown of antlers and is one of the most handsome and graceful of all deer. A smaller deer of Europe and Asia, the agile roe deer, is also very graceful and is an accomplished high jumper. Fossil deer are known from deposits of the late Tertiary period (see Elk; Geologic Time). See Caribou; Reindeer; Wapiti.

DEERE, JOHN, 1804–86, U.S. pioneer in the steel plow industry, was born in Rutland, Vt. Starting as a blacksmith, he moved to Grand Detour, Ill., where with Leonard Andrus he made the first steel plow in 1837. Ten years later he opened a factory in Moline, Ill., which was incorporated in 1868 as Deere and Company. Deere's plows and other farm implements are known throughout the world.

DEERFIELD, village, NE Illinois, Lake County; on the Milwaukee Railroad; 22 miles NNW of Chicago. The village was incorporated in 1903. Earth-moving equipment and type molds are manufactured here, and there are several plant nurseries. Pop. (1952 special census) 4188.

The white-tailed or Virginia deer is a favorite quarry of hunters. Small and wary, it ranges the American woods from Canada southward through Mexico to Peru and Bolivia.

WISCONSIN CONSERVATION DEPT.

DEERFIELD, town NW Massachusetts, Franklin County; on the Boston and Maine Railroad and U.S. Highway 5; 30 miles N of Springfield. Settled in 1665, the town was burned 10 years later during King Philip's War. In Queen Anne's War, 1704, it was raided by a force of Indians and French; about 50 residents were slain and more than 100 prisoners carried off. Old Deerfield Street, about a mile long, is lined with colonial structures. Deerfield Academy is one of the oldest boarding schools in the United States, and was established here in 1797. Pop. (1950) 3086.

STANERIGG KENNELS

The deerhound, rarely seen in the United States, is thought to be a descendant of the Irish wolfhound or of the hounds of the Picts. This dog hunts by sight rather than by scent.

DEERHOUND, a breed of dogs considered by some authorities to have sprung from the hounds of the Picts, while others believe it to be a descendant of the ancient Irish wolfhound. Often called the royal dog of Scotland, these dogs were widely used for hunting deer. Like the greyhound, the deerhound hunts by sight rather than by scent. It also resembles the greyhound in general appearance, although it is thicker, stronger, and coarser in build, and has a head somewhat longer and wider. The hair on the side of the lip forms a mustache, a feature not possessed by the greyhound. The deerhound should stand at least 28 inches high and weigh from 75 to 110 pounds. In color it may range from dark blue or black brindle to light gray brindle, yellow, fawn, dun, or drab.

DEE RIVER, N Wales and W England, rises in Bala Lake, Merionethshire, and flows generally NE through Denbighshire and Flintshire, N and NW through Cheshire, thence through a large estuary to the Irish Sea. The Dee River is about 75 miles in length, the shallow, sandy estuary about 14 miles long. Agricultural land has been reclaimed from the margins of the estuary.

DEE RIVER, Scotland, Aberdeen and Kincardine, rises in the Cairngorm Mountains and flows E to the North Sea at Aberdeen. The river has a length of nearly 90 miles, flowing past Braemar, Balmoral Castle, Ballater, and Banchory. The Dee is noted for salmon fishing; its valley, known as Deeside or Royal Deeside, is famous for its great beauty.

DEER LODGE, city, W Montana, county seat of Powell County; on the Clark Fork River, the Milwaukee and the Northern Pacific railroads, and U.S. Highway 10S; 30 miles NNW of Butte. The area was settled in 1852 and the city was incorporated in 1888. It is a trade center for the nearby ranching and logging area. Sawmills, railroad shops, and a state prison are in Deer Lodge. Phosphate is mined nearby. Pop. (1950) 3779.

DEER PARK, village, SW Ohio, in Hamilton County, on the Pennsylvania Railroad, a NE residential suburb of Cincinnati. Pop (1950) 7241.

DE FACTO, that which exists in fact as distinguished from that which exists in law (*de jure*). A government may exist by force when it has no legal recognition or constitutional right to exist; it is then a *de facto* government. An officer may claim an election and take office under color of title although some one else was legally elected to the post; he would then occupy the office *de facto*. A corporation is said to be *de facto* when it considers itself as such, presupposing that steps were taken to incorporate and a law exists under which it could have incorporated although it has not actually done so.

DE FALLA, MANUEL, full name Manuel de Falla y Mateau, 1876–1946, Spanish composer, was born in Cádiz. Following the custom of Spanish composers, De Falla in 1907 went to Paris, where he received encouragement and help from Claude Debussy, Paul Dukas, and Maurice Ravel. In 1913 at Nice, France, his *La vida breve* (Life Is Short), which in 1905 had won a prize as the best Spanish national opera but had never been performed in Spain, received its first performance. At the outbreak of World War I, De Falla refused to become a naturalized French citizen and returned to Madrid, where *La vida breve* finally received a Spanish performance in 1915. It was followed by *The Three-Cornered Hat* and *Wedded by Witchcraft*, both ballets. In 1916 de Falla finished his three pieces for orchestra and piano, *Nights in the Gardens of Spain*, for which he played the piano in a London performance in 1921. De Falla was a perceptive student of Spanish musical folklore; he was also considerably influenced by the impressionist composers. Disturbed by the political situation in Spain, De Falla went to Argentina in 1939, where he spent his last years in retirement. His works include the ballet *Love the Magician* (1915), the puppet-opera *Master Peter's Puppet Show* (1923), and pieces for piano and orchestra.

DEFENDANT, anyone against whom an action at law is begun. Formerly the defendant was anyone so placed in a personal action only. In order to obtain a personal judgment the defendant must always be brought within the jurisdiction of the court by the personal service of a summons upon him. However, in many states a person may be served constructively by publication of the summons in newspapers designated by the court, if he has property within the jurisdiction which can be attached. A judgment obtained after such service is not recognized in other states. If an infant is sued there must be a guardian *ad litem* appointed by the court. It is always necessary to serve the right person and to name him, but if the real name is unknown a fictitious name may generally be used, provided this is clearly stated. In some actions several defendants must be sued together as, for instance, in the foreclosure of a mortgage, but an improper joinder of defendants is cause for demurrer. The defendant has a specified time in which to answer the complaint, and if judgment is entered against him by default he has every reasonable chance to open the default upon affidavits showing why he did not appear.

DEFENESTRATION OF PRAGUE, an episode at the beginning of the Thirty Years' War. A group of Bohemian Protestant leaders hurled two representatives of the Holy Roman Emperor from a window of the Hradčany Palace in Prague May 23, 1619. The two men were only slightly injured, but the incident at once symbolized and made more bitter the antagonism between the Catholic and Hapsburg rulers on the one side and Bohemian nationalism and Protestantism on the other. See THIRTY YEARS' WAR.

DEFENSE, U.S. DEPARTMENT OF, the department of the executive branch of the national government which is responsible for the control and command of the armed services of the United States.

The National Security Act of 1947 created a separate air force coequal with the army and the navy, and was amended by the National Security Act Amendments of 1949 because the original act purportedly established the army, the navy, and the air force as separate and coequal executive departments rather than as military departments. Yet section 2 of the National Security Act of 1947 stated that: "In enacting this legislation, it is the intent of Congress to provide three military departments for the operation and administration of the army, the navy (including naval aviation and the United States Marine Corps), and the air force, with their assigned combat and service components." Section 4 of the National Security Act Amendments of 1949 stated that: "There shall be within the Department of Defense the Department of the Army, the Department of the Navy, and the Department of the Air Force, and each such department shall on and after the date of enactment of the National Security Act Amendments of 1949 [Aug. 10, 1949] be *military* departments in lieu of their prior status as executive departments."

The Constitution of the United States authorizes land and naval forces but naturally contains no authority for an air force. The five provisions in the Constitution which refer to land and naval forces are as follows:

1. "The Congress shall have Power . . . To raise and support Armies."
2. "The Congress shall have Power . . . To provide and maintain a Navy."
3. "The Congress shall have Power . . . To make Rules for the Government and Regulation of the *land* and naval Forces."
4. "The President shall be Commander in Chief of the Army and Navy of the United States."
5. "No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger."

The head of the Department of Defense is the secretary of defense, who is a member of the Presidential cabinet. There is a deputy secretary of defense and a secretary for each of the military departments (the army, the navy, and the air force) within the executive department.

DEFENSE MECHANISM, a conscious or subconscious form of behavior by which an individual seeks to maintain an integrated personality—a harmonious co-ordination of his behavior with his environment. It sometimes represents an adjustment to frustrating or conflicting situations.

Behavior which accompanies a defense mechanism is frequently aggressive to draw attention away from real or imagined failures, or regressive when childish or adolescent modes of response are resorted to by an adult. Physical escape from the situation or the substitution of another goal and the abandonment of that which presents conflict or frustration are also defense mechanisms whereby the individual works out some solution of a problem-fraught situation. See ADAPTATION, SOCIAL; ADJUSTMENT; RATIONALIZATION.

DEFFAND, MARIE ANNE DE VICHY-CHAMROND, MARQUISE DU, 1697–1780, French noblewoman famous for her cynical wit, was born at Château de Chamrond, was educated fashionably in a Parisian convent, and at 21 married Jean Baptiste de la Lande, Marquis du Deffand. It was a marriage of convenience only. The marquise was intellectual companion to many literary men of her day, among them Voltaire, Jean d'Alembert, Montesquieu, and Horace Walpole.

DEFIANCE, city, NW Ohio, county seat of Defiance County, at the confluence of the Tiffin and the Auglaize rivers with the Maumee River; on the Baltimore and Ohio and the Wabash railroads and U.S.

Highway 24; 48 miles SW of Toledo. Defiance is a manufacturing and agricultural trade center. Its varied industries include machinery, household appliances, metal products, automotive parts, food and dairy products, communications equipment, and hardware. The city was laid out in 1822 on the site of Fort Defiance, established by Gen. Anthony Wayne in 1794. It is the seat of Defiance College. Pop. (1950) 11,265. See Fort Defiance.

DEFIANCE COLLEGE. See Colleges and Universities.

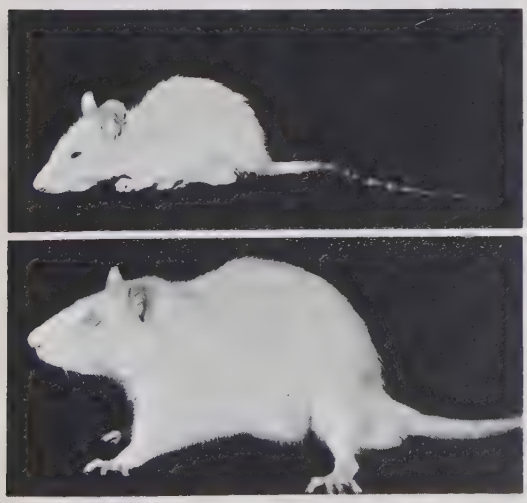
DEFICIENCY DISEASE, a disease characterized by the lack of proper nutrients in the tissues. It arises either from failure to eat an adequate amount of proper food or from failure to absorb, assimilate, or utilize it.

Physicians frequently are asked, "Is my diet satisfactory? Am I well fed?" Without a great deal of study, the physician cannot state with certainty that any person's diet is optimum. Some health authorities and committees have stated that if the diet is adequate, vitamins or other dietary supplements are not needed, but such general advice without consideration of specific facts can be misleading.

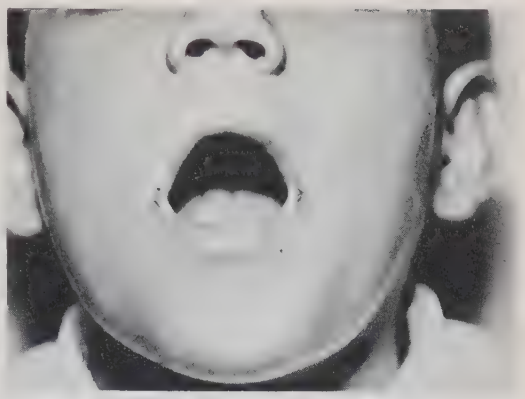
Among dietary deficiencies the lines of demarcation between the normal and subnormal, and the subnormal and abnormal, are not well defined. Every patient with a deficiency disease is unique. Often there is some predisposing deficiency that determines the first outward manifestation. Prolonged undernutrition or malnutrition, termed nutritive failure, is in effect a mixture of diseases operating simultaneously—hence the need for a well-balanced diet rich in proteins, vitamins, and minerals. Prolonged undernutrition leads to a loss of body weight, strength, and sense of well-being which, if severe enough and neglected long enough, culminate in death. Such a state is arbitrarily considered to be chronic starvation. It differs from a deficiency disease, however, in that the deficiency disease is the response of the body to an inadequacy of some but not all of the constituents of the diet. For example, in obesity there may be a surplus of calories but a deficiency of vitamins and other essential nutrients.

The body uses carbohydrates (starches and sugars) almost entirely as fuel (see Carbohydrate) and can convert them into fat. Fats also are used as fuel, and some unsaturated fatty acids—linoleic, linolenic, and arachidonic acids—have been shown to be indispensable in the diet of the rat.

Proteins are highly specific and are composed of constituents known as amino acids (see Amino Acid).



Pictured above is a young white rat after 40 days on the same diet as that of the woman who has pellagra. Below is the rat after being placed on a suitable diet for 30 days.



Lesions (cheilosis) at the corners of child's mouth show deficiency of riboflavin in the diet. The ailment is the most common deficiency disease in the United States today.

Proteins are the most expensive constituents of the diet and so are most likely to be absent during periods of hardship. Hunger edema can be traced directly in some cases to an inadequate protein intake (see Edema), which in turn contributes to lowering of strength and resistance to infections.

Carbohydrates, fats, and proteins, which serve as the bulk of the diet, comprise the organic materials necessary for life. Also essential, although in minute amounts, are vitamins and trace minerals which act as catalysts or "spark agents" in all the activities of the body. See Catalysis; Enzyme.

Vitamins. Some of the vitamins are fat-soluble, and when the diet is low in fat there frequently is a lack of fat-soluble vitamins such as vitamin A (see Vitamin A). This vitamin, essential in an optimal diet, helps to maintain the cells that line the various cavities and the cells of the skin, and also aids the body in fighting infections. Persistent lack of vitamin A leads to night blindness, then dryness of important eye structures, infection, and in extreme cases complete destruction of the eyes. Carrots and other yellow vegetables are particularly good sources of this vitamin. The lack of vitamin D, the sunshine vitamin also found in cod liver oil, results in rickets and bone deficiencies (see Vitamin D; Rickets). When vitamin K is lacking the blood cannot clot properly (see Vitamin K). The result is a tendency to hemorrhage, especially in evidence among the newborn. Pregnant women and persons with diseases of the liver are the most prone to develop hemorrhages from vitamin K deficiency. Carrots, strawberries, wheat, and pork liver supply this vitamin.

Ascorbic acid, or vitamin C, prevents or cures the oldest recognized deficiency disease, scurvy (see Scurvy), characterized by general debility, swelling of joints and gums, loosening of the teeth, and hemorrhages. Citrus fruits and tomatoes are excellent sources of vitamin C.

Among the water-soluble vitamins that make up the B complex are five whose absence or relative insufficiency produces distinct deficiency diseases (see Vitamin B). (1) Thiamin, or vitamin B_1, is needed for the final stages of carbohydrate oxidation. It is found in meat, vegetables, and whole grain cereals. Without it nervous tissues are particularly handicapped in their metabolism. Polyneuritis, or inflammation of nerve fibers, develops and paralysis or convulsions ensue. Loss of appetite accompanying lack of thiamin further aggravates the condition. The curative effect of thiamin on the deficiency disease beriberi in the Far East is remarkable. (2) Riboflavin, or vitamin B_2 is necessary for general health and for tissue respiration. Lesions on the lips, in the angles of the mouth (cheilosis), and on the tongue (glossitis) are the most characteristic symptoms of

White woman afflicted with pellagra exhibits typical skin lesions. Prevention of the ailment is best accomplished by including adequate amounts of niacin in the daily diet.

its deficiency, and the eyes are frequently damaged. Kidney, heart, and liver are rich sources of vitamin B_2. (3) Niacin, or nicotinic acid, is a component of coenzymes I and II, which are important in sugar metabolism and in cell respiration. Dramatic cures of pellagra have been achieved through the use of this vitamin. Pellagra is prevalent throughout the world, particularly in areas where corn is an important element of the diet. Aside from the symmetrical inflammation of the skin that gave the disease its name, pellagra affects the gastrointestinal tract and the nervous system and may lead to mental illness. Like vitamin B_2, niacin is found in the specialty meats. (4) Folic acid, pteroylglutamic acid, is an important member of the vitamin B complex group. Apparently it is essential to bacterial and all cell life and exists in nature in many forms. Liver, kidney, and dark green leafy vegetables are rich in folic acid, and beef and veal contain moderate amounts. Following the administration of folic acid or substances which contain enough of it, people with certain types of anemia in relapse dramatically begin to regenerate blood and gain in strength and vigor. Pregnant women must have folic acid in their diet or they develop an anemia which is passed on to their offspring. Many of the tropical anemias can be successfully treated with folic acid (see ANEMIA). Yeast is a good source of all B complex vitamins except vitamin B_{12}. (5) Vitamin B_{12} is the most potent therapeutic substance per unit of weight known (see VITAMIN B_{12}). One microgram, or one 5-millionth of a teaspoonful, given each day can mean the difference between life and death to the person with pernicious anemia. Substances that have vitamin B_{12} are widely scattered in nature. However, ordinary foods contain such small amounts of vitamin B_{12} that their ingestion does not produce beneficial effects in persons with pernicious anemia in relapse. Liver, one of the most highly concentrated of the natural sources of vitamin B_{12}, contains relatively little of it. Folic acid and vitamin B_{12} are both present in liver, and many of their functions overlap, yet both are highly specific and one cannot replace the other. For example, folic acid is necessary to the pregnant woman and her child, and vitamin B_{12} is essential for the integrity of the nervous system. The gastric juice of a normal person contains a ferment which enables him to absorb vitamin B_{12}, but the patient with pernicious anemia tends to lose this ferment as he gets older, with the result that vitamin B_{12} is excreted from his intestinal tract unused.

Pyridoxine and pantothenic acid also belong to the B complex group of vitamins. Convulsions appear in rats and pigs restricted to a diet lacking in pyridoxine. In the United States a group of infants who were on a diet containing little pyridoxine also developed convulsions, which disappeared when this vitamin was given to them. When patients have deficiency diseases and lack the B group of vitamins, pantothenic acid is generally low in their blood and other tissues.

Apparently man does not develop a deficiency of just one of the B group of vitamins; therefore, mixed therapy to combat all the patient's diseases simultaneously rather than one at a time is based on sound scientific reasoning. More vitamins have been discovered than diseases against which to use them; furthermore, their precise action is not altogether understood. It is known that vitamins play an important role in the metabolism of fats, protein, and carbohydrates. They are known to be concerned with antibody formation, resistance to infection, sight conservation, tissue healing, and integration of certain mental and nervous functions. They are necessary for maintaining the resistance of small blood vessels to rupture, for the adequacy of blood regeneration, for the proper clotting of the blood, and for the proper structure and strength of the muscles and bones.

Minerals. In order to have health or freedom from disease the body must be supplied with certain minerals in addition to carbohydrate, fat, protein, and vitamins. These minerals frequently are called inorganic salts and are constituents of the fluid that bathes and nourishes the body's cells; they are necessary for building the body tissues and must constantly be supplied to replace those lost in the urine, feces, and sweat.

Sodium chloride, or table salt, is excreted through sweat, and a serious depletion may result in cramps, prostration, and even death. Calcium, and to a lesser extent magnesium, is united with phosphates and other compounds to make healthy cells and bones and teeth. Iron is essential for the formation of hemoglobin and for respiration in tissues. Iodine is necessary to produce the hormone of the thyroid gland; if there is inadequate thyroid function all the tissues of the body eventually become deranged. Potassium is important for the maintenance of health. Cobalt, in the amount of 4 per cent by weight, is a component of vitamin B_{12}. Less is known about the specific functions of manganese, zinc, silver, boron, nickel, aluminum, arsenic, and fluorine, although normally they are found in small amounts in the body. See DIET.

TOM D. SPIES, M.D.

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DEFLATION. See INFLATION.

DEFOE, DANIEL, 1660?–1731, English pamphleteer, journalist, and novelist, was born in the parish of St. Giles, Cripplegate, London, the son of a butcher named James Foe, who was a dissenting Presbyterian. Many of the facts about Defoe's life are imperfectly known (including the date of his birth), but it is both well established and highly significant that he was born into the nonconforming, Whig tradition and the burgeoning middle class of tumultuous early eighteenth century London (See NONCONFORMITY). At the age of fourteen, Defoe was sent to an academy at Newington-Green kept by a clergyman, where he

received the typically plain but solid dissenting education. Although educated for the ministry, Defoe chose to go into business in 1685 as a "hosiery factor," a kind of middleman between the retailer and the manufacturer of products that would later be classified under the general heading of haberdashery.

N.Y. PUB. LIB.
Daniel Defoe

During this same year he took part in Monmouth's rebellion, an unsuccessful attempt by Protestants to prevent the succession of James II, and by this time records indicate that he had made an advantageous marriage. He became a liveryman for the City of London in 1687 and in 1688 joined the army of William of Orange, being the following year in the troupe which escorted William and Mary into London.

Defoe's business enterprises over this period had become more ambitious and involved, and in 1692 it was necessary for him to go into bankruptcy. His indebtedness amounted to £17,000 and although he gradually paid back the greater part of this sum, his reputation was so tarnished as a result of attempts to avoid payment of some of his debts and consequent lawsuits (which put him further into debt) that he never fully succeeded in freeing himself from the taint of insolvency. However, his financial condition was somewhat improved by 1695, when he ventured into a tile manufacturing business at Tilbury, Essex.

Faced with the need to recoup his financial losses, Defoe turned to journalism, his first important work being the *Essay upon Projects* (1698), which he had begun in 1692 in his effort to recover from bankruptcy. The essay included suggestions for such diverse projects as a national bank, savings banks, and idiot asylums, and proved Defoe to be one of the more intelligent social observers of his time. His only important poem, the satirical *The True-born Englishman* (1701), an attack upon the enemies of William III and a plea for sympathy among differing national strains, brought him money, the king's friendship—and considerable popularity. The death of the king that same year found Defoe deeply implicated in the current political intrigue. His political feelings impelled him to write the brilliant but personally disastrous satire *The Shortest Way with Dissenters* (1702), whose irony so deceived and infuriated his friends and opponents alike that in the confusion he was heavily fined, sentenced to three days in the pillory, and finally imprisoned in Newgate. He turned his time in the pillory to good account by publishing the *Hymn to the Pillory* and selling it in large quantity to the crowd which had gathered to turn his punishment into a dissenters' celebration.

He continued to write in prison, and it was just before his release in 1704 that he started his famous newspaper *The Review*, the first issue of which appeared on Feb. 17, 1704. Written entirely by Defoe, and published regularly until 1713, *The Review* was a landmark in English periodical literature; it presented discussions of all the political questions of the day and included a special department called The Scandal Club, which influenced such later papers as *The Tatler* and *The Spectator*. Defoe was rescued from prison in August 1704 by the Tory politician Robert Harley, and there is evidence that, like many other Grub street authors who could not afford to be too scrupulous, Defoe promised, as a condition of his rescue, not to write against the government any more. Harley became Queen Anne's minister and in 1704 and 1705 employed Defoe as a secret political spy in England. In 1706–07 he was in Scotland as an agent working for the union of the Scottish and English parliaments; this union was achieved in 1708. *The True Relation of the Apparition of One Mrs. Veal* (1706), a long political satire in twelve volumes of poor verse; and his *History of the Union* (1709), were among his more important published works during this period.

The last years of Queen Anne's reign were full of political unrest, and Defoe opportunistically switched his allegiance from Tory to Whig and back to Tory depending upon which minister was in power. As a result, when Harley in 1714 had his final fall from grace and Queen Anne died leaving the throne to the Hanoverian George I, Defoe was in great disrepute. With the pamphlet *Appeal to Honor and Justice* (1715) he attempted to regain esteem; the attempt failed. His next effort was the enormous first volume of *The Family Instructor* (1715), a moralistic handbook written in dialogues; but by 1718 he was again in the service of the government, writing for both Tory and Whig newspapers as a sort of journalistic spy.

In 1719, at almost 60 years of age, Defoe suddenly published the first of the several works upon which his literary fame was to rest. *Robinson Crusoe* (1719), a work of fiction based on the factual case of Alexander Selkirk, was a tremendous success (see Robinson Crusoe). In 1720 Defoe published an inferior sequel to *Robinson Crusoe*, and several prose fictions such as *The Life and Adventures of Duncan Campbell*, *Memoirs of a Cavalier*, and *Captain Singleton*. The ribald *Moll Flanders* (1722) is still considered one of the Great English novels, and *The Journal of the Plague Year* (1722) is a masterpiece of historical realism. Two more novels appeared that same year, *The History of Colonel Jack* and *Roxana*, both dealing with London low life. Between 1724 and 1726 he published his famous travel book *A Tour Through the Whole Island of Great Britain* and between 1725 and 1727 *The Complete English Tradesman*, an amusing glorification of money-getting. In 1726 and 1727 he published several works dealing with occult subjects in which he had long been interested, including *The Political History of the Devil* (1726), *System of Magic* (1726), and *Essays on the Reality of Apparitions* (1727). Sometime during the early 1720s Defoe built a fine home at Stoker-Newington—an indication that his financial condition must have been somewhat improved.

His last years are shrouded in mystery. In June 1725 he adopted the pen name of Andrew Moreton for purposes of concealment and used it frequently for the rest of his life. In 1730 he went into hiding away from his home, possibly because he feared retaliation for his earlier political activities. During his last days his affairs fell into greater confusion than ever before, and he died of a "lethargy" in Ropemakers Alley, Moorfields, Apr. 26, 1731; he was buried in Bunhill Fields.

Defoe was one of the greatest of English writers—fantastically prolific, a brilliant journalist, an incomparable realist in fiction, and a master of a simple but subtle and artistic style. All of these factors contributed to the significant influence which his work exerted upon the journalism and literature of subsequent generations. Rachel Gilbreath

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DE FOREST, JOHN WILLIAM, 1826–1906, U.S. author, was born in Humphreysville (now Seymour), Conn. While traveling and teaching he became a successful writer. He served in the Union army in the Civil War, rising to the rank of brevet major of volunteers. After the war he settled in New Haven, Conn. Known for his realistic war scenes, De Forest wrote *Miss Ravenel's Conversion from Secession to Loyalty* (1867), *Kate Beaumont* (1872), and a number of other novels. E. B. Long

DE FOREST, LEE, 1873– , U.S. inventor known as the father of radio, was born in Council Bluffs, Iowa. De Forest patented some 300 inventions devoted chiefly to the transmission of sound. His greatest contribution in this field was made in 1907 when he invented the three-electrode vacuum tube, an audion amplifier that made possible the transcontinental transmission of sound by telephone. De Forest's invention of the oscillating audion as a source of radio-frequency current, together with the audion tube, led to the first dramatic demonstration of voice transmission over the air—his radio-telephone call from Arlington, Va., to the receiving station atop the Eiffel Tower in Paris in 1915. De Forest made the first radio news broadcast in 1916 and in 1923 exhibited sound-on-film motion pictures at the Rivoli Theater in New York City. The recipient of numerous awards and honors, De Forest also contributed to the development of television, high-speed facsimile transmission, and radiotherapy. He wrote *Television Today and Tomorrow* (1942).

DEFORMATION. See Elasticity; Elastic Limit; Mechanics.

DEFREGGER, FRANZ VON, 1835–1921, Austrian painter, was born in the Tyrol and spent his youth as a farm laborer. He had no opportunity to study art formally until he was 25 years old, when he went to Innsbruck to the studio of Franz Stolz, the sculptor. Stolz sent him to Munich to study with Piloty, one of the foremost teachers of painting of that period. Defregger's major paintings were of scenes from Tyrolese history, especially those depicting the struggle for freedom led by Andreas Hofer in 1809. Typical of these were *Speckbacher* (1869), *The Victor's Return* (1876), and *Hofer Going to His Death* (1878). The subject matter of the paintings, in addition to the fine technique they displayed, made them almost immediately popular. Defregger also painted many scenes from Tyrolese peasant life, such as *The Prize Horse* (1873).

DEGAS, HILAIRE GERMAIN EDGAR, 1834–1917, French painter allied with the impressionists, was born in Paris. He early persuaded his wealthy parents to permit him to forego law in favor of art. From the beginning he reconciled in his own tastes the most diverse elements of French art, learning from both the classical Ingres and the romantic Delacroix;

ART INST. OF CHICAGO

Degas' Bronze, *Spanish Dance*, One of His Few Sculptures

he also studied the much neglected naturalist Camille Corot. But Degas' creative spirit soon led him to the company of radicals who were later to be dubbed impressionists.

In 1859 he painted the family of his aunt, Baroness Belleli, in Florence, a work in which his genius for spontaneity was already apparent. In 1862, in his search for the depiction of arrested movement, he began to paint such untraditional subjects as the Longchamps horse races, and found in the characteristic movements of laundresses ironing, women bathing, and dancers the quality of motion he hoped to portray. In the 1860s Paris discovered Japanese prints; Degas was much interested in their off-center composition and decorative quality. At the Paris

ART INST. OF CHICAGO

In his pastel *Woman in Rose Hat*, painted by artificial light, Degas stressed an off-center composition while adhering to his typically stylized blending of color and realism.

ART INST. OF CHICAGO

***Two Dancers*, a Degas pastel. Although identified with impressionism, Degas deviated from its principles in his individualistic color treatment and delineation of form.**

Opera he found the kind of disciplined movement he had found at the horse races: the ballet girls, in their stylized postures, became a favorite subject and are his most famous theme. In 1872 he went to New Orleans, the birthplace of his mother, where his brothers were established cotton merchants. Here he painted family portraits, a scene in a broker's office, and *The Cotton Market in New Orleans* (1873), in which he successfully synthesized his many experiments toward the candid portrayal of everyday life. Back in Paris, the impressionists organized their first group show in 1874, and Degas participated as one of the leaders; the show had only the success of scandal but the group persisted through the years with seven more exhibits which, although always attacked, eventually resulted in glory for the survivors. Unlike most of the group Degas was mainly concerned with conception and composition, not with revolutionary techniques or color schemes; he also differed with them on the question of outdoor painting, much preferring to work in the studio. The technique of pastel began to interest him, and he achieved vibrant color effects in this less linear medium. Toward the end of his long life failing eyesight led him to work with his hands as much as his eyes, and he turned to modeling in wax and clay. In spirit and style, his closest follower was Henri de Toulouse-Lautrec. See FRENCH ART.

ANTHONY KERRIGAN

DE GASPERI, ALCIDE, 1881–1954, first premier of Italy's first republic, was born in the Trentino, Austria. A stanch anti-Fascist, he was a founder of the Christian Democrat party, and a firm ally of the Western Powers. De Gasperi was premier from December 1945 until July 1953.

DE GAULLE, CHARLES ANDRÉ, 1890– , French general and provisional president after the liberation of France in 1944, was born in Lille but spent much of his childhood in Paris, where his father was a professor of philosophy at a Jesuit college. An honor graduate of the École Militaire de St. Cyr, De Gaulle was a captain in World War I under Pétain. De Gaulle's book *Vers l'armée de métier*, 1934 (*The Army of the Future*, 1941), a brilliant analysis of the fallacy of a static defense policy exemplified in the French reliance on the Maginot Line, was ignored by the French general staff. However, it was carefully studied by the militarists of Nazi Germany who are thought to have modeled their famous Panzer divisions on De Gaulle's blueprint for a modern armored column. After the fall of France and the Pétain truce, De Gaulle fled to London. On June 20, 1940, he announced the formation of a National Liberation Committee with himself as head, called for volunteers for his Free French army, and encouraged the Resistance movement inside France. He returned to France after the liberation and became president of the provisional government. Almost immediately he was beset by problems arising from conflicts over the proposed new constitution and legislative reforms. He wanted a strong presidency instead of the traditional strong legislature and, failing to achieve this, he resigned from office in January 1946.

There was much discussion about De Gaulle's place as a military and political leader. General Dwight Eisenhower in his *Crusade in Europe* (1948) said: "I personally liked General De Gaulle . . . we felt however, that [his] many fine qualities were marred by hypersensitiveness and an extraordinary stubbornness in matters that seemed inconsequential to us." The body of opinion seems to indicate that although De Gaulle heroically resisted fascism in the form of the Nazi threat to France, his extreme nationalism not only led him into many disputes that might have been avoided by a less rigid thinker but also inspired fear that his reform party, the French People's Rally, might develop into a fascist dictatorship with De Gaulle as leader. In a speech in 1955 he announced the tentative withdrawal of the Rally from politics and the release of De Gaullist deputies and senators to an independent status. But De Gaulle also made clear that if the summons should come again he and the Rally stood ready as "the advance guard of the nation." Among De Gaulle's writings are *France and Her Army* (1946) and an autobiography, the first volume of which appeared in 1955.

DE GEER, GERHARD JAKOB, BARON, 1858–1943, Swedish geologist, was born in Stockholm. After investigating deposits of sand and clay (*varves*) in the Baltic regions De Geer worked out a system of dating geological events by determining the exact location of a retreating glacier at various points in its history. He reported the results of his studies in *On the Physical Explanation of the Ice Age* (1935) and *Principles of Geochronology* (1938). De Geer founded the Institute of Geochronology at the University of Stockholm.

DEGREE originally was a teaching license granted by a university, hence the Latin designation Doctor, or "teacher." In modern times a degree is an earned distinction or rank conferred by a university upon students who have fulfilled its requirements for graduation. A degree is also conferred *honoris causa* on persons who have especially distinguished themselves in such fields as letters, arts, music, public service, and philanthropy.

The master's degree, or *magister*, originated in the twelfth century and in the early medieval schools was synonymous with the terms doctor and professor. Gradually the master's degree began to be used to denote the "inferior" faculties of arts and grammar, while the term doctor was applied to the "superior" faculties of theology, law, and, later, medicine. The bachelor's degree came into use during the thirteenth century, and probably arose as a slang expression applied to any senior student who was intending to proceed to the master or doctorate level. See BACHELOR'S DEGREE.

Forms of Degrees. In France and the Latin American countries bachelor's degrees are awarded at the end of secondary education and bear no similarity to the bachelor's degree in England, the United States, and Canada. The master's degree is no longer conferred on the Continent, where the only recognized scholastic title is that of doctor.

In the United States the tremendous growth of colleges and universities, coupled with the increased demand for complex differentiation of courses and the addition of new branches of specialization, have led to a great increase in the forms of the undergraduate degrees. Traditionally, the bachelor of arts, and of science, divinity, or law are still the standard degrees representing the completion of the regular four-year curriculum. The master of arts or of science represents graduate work of at least one additional year. A doctor of philosophy degree represents a graduate course of three years beyond undergraduate preparation, involves the presentation of an original piece of research, and usually includes the master's program.

The associate degree or certificate, usually in arts or sciences and representing the completion of a two-year course of study, was first authorized by the University of Durham, England, in 1865. It is offered by a number of U.S. colleges that have two-year junior college divisions and became the basic degree among junior colleges in the twentieth century.

The doctoral degree generally is the form used when conferring an honorary degree, although the master's degree is sometimes used, and the doctoral degree regularly is given for the completion of studies in the healing arts. Master's and doctor's degrees may be awarded by qualified law schools. In divinity studies there are only the bachelor and doctor degrees. In addition, degrees are conferred in a large number of departments representing highly specialized concentrations, and usually having their own

degree, as B.S.N. (Nursing), B.L.S. (Library Science), or B.C.E. (Chemical Engineering). Many of these specializations have like designations at the master's level, but the Ph.D. degree is generally retained as the most advanced degree in the arts and sciences. In recent years the movement has been to grant such degrees as LL.D., D.D., Litt.D. and D.H.L. as honorary degrees, to distinguish them from degrees which are earned by examination. EDWARD M. STOUT

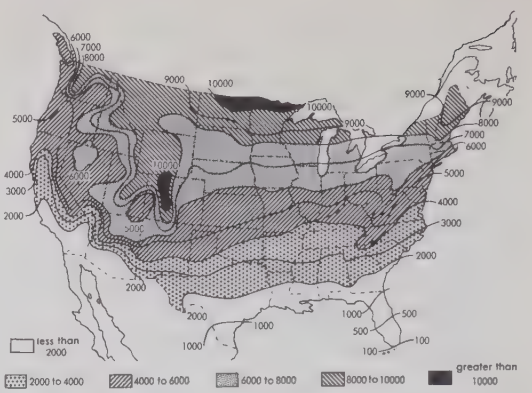
Some of the more usual degrees are:

A.A., Associate in Arts
A.S., Associate in Science
A.B. or B.A., Bachelor of Arts
A.M. or M.A., Master of Arts
B. Arch., Bachelor of Architecture
B.B.A., Bachelor of Business Administration
B.C.E., Bachelor of Civil Engineering
B.Ch.E., Bachelor of Chemical Engineering
B.C.S., Bachelor of Commercial Science
B.D., Bachelor of Divinity
B.Ed., Bachelor of Education
B.E.E., Bachelor of Electrical Engineering
B.F.A., Bachelor of Fine Arts
B.J., Bachelor of Journalism
B.L.S., Bachelor of Library Science
B.M.E., Bachelor of Mechanical Engineering
B.Mus., Bachelor of Music
B.S. or Sc.B., Bachelor of Science
B.S.Ch.E., Bachelor of Science in Chemical Engineering
B.S.C.E., Bachelor of Science in Civil Engineering
B.S.E.E., Bachelor of Science in Electrical Engineering
B.S.L.S., Bachelor of Science in Library Science
B.S.M.E., Bachelor of Science in Mechanical Engineering
B.S.N., Bachelor of Science in Nursing
B.T., Bachelor of Theology
D.C.E., Doctor of Civil Engineering
D.D., Doctor of Divinity
D.D.S., Doctor of Dental Surgery
D.H.L., Doctor of Humane Letters
D.M.D., Doctor of Dental Medicine
D.O., Doctor of Osteopathy
D.P.H., Doctor of Public Health
D.V.M., Doctor of Veterinary Medicine
Ed.D., Doctor of Education
Ed.M., Master of Education
J.D., Doctor of Jurisprudence
Litt.B., Bachelor of Letters (Literature)
Litt.D., Doctor of Letters
LL.B., Bachelor of Laws
LL.D., Doctor of Laws
LL.M., Master of Laws
M.B.A., Master of Business Administration
M.C.E., Master of Civil Engineering
M.C.S., Master of Commercial Science
M.Ch.E., Master of Chemical Engineering
M.D., Doctor of Medicine
M.E.E., Master of Electrical Engineering
M.F.A., Master of Fine Arts
M.Mus., Master of Music
M.S., Master of Science
M.S.W., Master of Social Work
Mus.D., Doctor of Music
O.D., Doctor of Optometry
Ph.B., Bachelor of Philosophy
Ph.D., Doctor of Philosophy
Ph.G., Graduate in Pharmacy
Sc.D., Doctor of Science
S.T.D., Doctor of Sacred Theology

DEGREE, in geometry, is a unit of angular measure. A circle is divided into 360 angular units, or degrees. The angular distance between two intersecting lines is frequently measured in degrees, although the radian (equal to 57.2958 degrees), is also widely used as a unit. (See ANGLE, *Units*). The degree is divided into 60 minutes, each of which is divided into 60 seconds. A surveyor, for example, may measure an angle between a building and a reference point as 31 degrees, 22 minutes, and 48 seconds, commonly written as 31°22′48″. The degree does not have the dimensions required for many mathematical calculations. However, trigonometry (see TRIGONOMETRY) provides a method for expressing degrees as a ratio of distances between the sides of a triangle, and these ratios can be used for further calculations.

Algebraic equations and terms are classified as 1, 2, 3, 4, . . . nth degree equations. The equation $2x^2y - 3y + 5 = 0$ is classified as a second degree equation in x (because x is raised to the second power), a first degree in y (since y is raised to the first power), and a third degree in x and y (because the sum of the x and y exponents equals 3). See EQUATION; EXPONENT; POLYNOMIAL; LATITUDE AND LONGITUDE; THERMOMETER.

DEGREE DAY UNIT, a measure for determining approximate heating requirements for buildings. It is based on the premise that no artificial heat is required



Degree-Day Zones in the Contiguous United States

to maintain a building at 70° F if the average of a day's maximum and minimum outside temperature does not fall below 65°. Each degree that the average outside temperature falls below 65° is a degree day. Thus, if the average temperature of a day is 60°, the number of degree days is 5. Degree days are totaled and reported regularly by several agencies in the United States. The information is used by multiplying the number of degree days in a given period by the fuel or steam consumption per degree day of the building being studied; this gives the building's probable consumption of fuel or steam in that period.

DEHLI. See DELHI.

DEHMEL, RICHARD, 1863–1920, German lyric poet, was born in Wendisch-Helmsdorf. His work contains two basic motifs, the erotic and the sublime, both evident in *Zwei Menschen* (1903), which Dehmel considered his most important work. In it he attempted to synthesize the spiritual and the physical aspects of human affections. Other works include the verse collections *Aber die Liebe* (1893), *Weib und Welt* (1896), his war diary, *Zwischen Krieg und Menschheit* (1920), and several juveniles. Dehmel is less important for his own work than for having cleared the literary air to allow freer expression to better artists.

DEHN, ADOLF, 1895– , U.S. painter and lithographer, was born in Waterville, Minn., and studied under Boardman Robinson in New York. He later spent seven years abroad, mostly in Vienna, where he was introduced to the work of George Grosz, one of this century's most important artists. Dehn's early work, almost entirely in black and white (drawings and lithographs), was largely Grosz-influenced social satire; he later turned to water color. His paintings of farm and small-town scenes became part of the collections of the Metropolitan, Whitney, and other leading museums.

DEHRA or **DEHRA DUN,** city, N India, in the state of Uttar Pradesh, capital of the district of Dehra Dun; 95 miles NNE of Delhi. The town of Dehra developed around a temple built in 1699 by the Hindu Udasi sect. The principal industries of Dehra include the processing of tea and grain raised in the area, and the manufacture of lumber, furniture, and charcoal. There are sulfur springs and baths nearby. Dehra is the site of the Forest Research Institute, founded in 1906, that developed from a school established in 1867. The Indian Military Academy, founded in 1932, was expanded in 1949 to include facilities for training officers for the navy and air force and the name was changed to Armed Forces Academy. An archaeological survey laboratory and a sericulture research station are also located there. Pop. (1951) 144,216.

DEHUMIDIFY. See AIR CONDITIONING, *Relative Humidity*.

DEHYDROCHOLIC ACID is a derivative of cholic acid, a constituent of bile. Its principal use is for flushing the biliary passages, by increasing the

volume of bile secreted by the liver and to a lesser extent, perhaps, the solid content of the bile. Dehydrocholate, a soluble sodium salt of dehydrocholic acid, has the same therapeutic action as dehydrocholic acid. It is also used in determining the circulation time of the blood, a valuable diagnostic test. This test is made by injecting rapidly into the cubital vein, in the forearm, a solution of dehydrocholate; the time that elapses from the moment the injection begins until the patient notices a bitter taste in the mouth represents the arm-to-tongue circulation time, which in normal persons ranges from 9 to 16 seconds.

THEODORE KOPPANYI

DEIANIRA, in Greek mythology, the wife of Hercules. She sent her husband a cloak steeped in the blood of the centaur Nessus, who had assured her that it would keep Hercules faithful to her. When Hercules donned it he was burned to death and Deianira killed herself. This tale is the theme of Sophocles' tragedy *Trachiniae.*

DEIRA, the southern part of the kingdom of Northumbria in Britain under the Angles and Saxons. It included approximately the area between the Humber and Tees rivers, and was several times united with Bernicia in the seventh and eighth centuries. See BERNICIA; NORTHUMBRIA.

DEIRDRE, the heroine of the Irish legendary tale "*The Sons of Usnach,*" was the daughter of Fedlimid, a harpist at King Conchobar's court. Although he was told by Cathbad the Druíd that Deirdre's beauty would bring tragedy to heroes, the king had her brought up as his prospective bride. But when Deirdre met Naoise, one of the sons of Usnach, they fell in love, and she was taken to Scotland by Naoise and his brothers. Although they had been promised a safe return by Conchobar, the brothers were murdered upon their return to Ireland. When Deirdre heard of the infamy she killed herself. The story has been adapted by numerous writers.

DEISM, the doctrine that God's existence is revealed by natural reason rather than by supernatural revelation, which is the basis of theism. (Etymologically, both refer to God, deism being derived from Latin, theism from Greek.) By deism is usually meant the rationalistic movement in England in the seventeenth and eighteenth centuries. The English movement was a reaction to the long religious controversy between the established church and dissenters, but it was also an outgrowth of modern scientific progress. The deists hoped to apply the principles of the Enlightenment to religion. Believing that the work of God is revealed in the created universe and that God works through the laws of nature, they tried to found a natural religion in opposition to all positive religions and to all supernatural mysteries. While they differed among themselves, the deists generally agreed that God *was* the creator of all things and *will be* the judge of all men, but they denied His providence and presence in the life of the world. Among the leaders of deism were Lord Edward Herbert of Cherbury, Matthew Tindal, and Viscount Bolingbroke; in the United States Thomas Paine was an exponent of an elementary form of deism. See ENLIGHTENMENT; THEISM.

DEJ or **DES,** town, N Rumania, Transylvania, in the province of Cluj, 29 miles NNE of Cluj. Dej is a railroad junction and market center in a farming region. Local produce includes cereals, cattle, sheep, fruits, and vegetables. Industries in the town are chiefly the manufacture of food products, leather, paper, and pottery. Salt is mined nearby. About half the population of Dej, an old Transylvanian Hungarian settlement, is Magyar. Pop. (1950 est.) 15,000.

DE-JIMA or **DESHIMA.** See NAGASAKI.

DE KALB, JOHANN, BARON, 1721–80, German soldier of fortune in the American Revolution, was born in Hüttendorf, Bavaria. Commissioned a major general in the Continental Army, 1777, he was with George Washington at Valley Forge. De Kalb died from wounds received at Camden.

DE KALB, city, N Illinois, in De Kalb County, on the south branch of the Kishwaukee River, on the Chicago Great Western, the Milwaukee, and the North Western railroads and U.S. Highway 30A; 57 miles W of Chicago. Situated in a notably rich farming area, De Kalb's principal industries are barbed wire and screens, truck bodies, pianos, electrical supplies, women's clothing, forgings and castings, canned vegetables, and printing and publishing. De Kalb has been called the "Barb City" because here, in 1874, barbed wire was patented by Joseph F. Glidden and Jacob Haish. It is the home of the De Kalb Agricultural Association, an organization of the largest producers of hybrid seed corn and hybrid poultry in the United States, and the site of Northern Illinois State Teachers College. Pop. (1950) 11,708.

DEKKER, EDUARD DOUWES, 1820–87, sometimes called Multatuli, Dutch novelist, was born in Amsterdam and in 1838 went to the Dutch East Indies. He entered the colonial service as an assistant resident at Lubak, Java, but soon resigned in protest against the inhumane treatment of the Javanese people by their own officials and by the Dutch colonials. Dekker's novel, *Max Havelaar* (1860), written after his return to the Netherlands, was a powerful condemnation of colonialism, and his *Minnebrieven* (1861) was a group of bitingly satirical commentaries on the same subject.

DEKKER, THOMAS, 1572?–?1632, English dramatist, poet, and pamphleteer, of whose origin and background almost nothing is known. He began in about 1598 to collaborate with Ben Jonson and others in writing dramas, but most of this work has been lost. Dekker's best known dramas were *The Shoemaker's Holiday* (1600), which features the character of Simon Eyre, a comic creation comparable to the best of Dickens; *Satiromastix, or the Untrussing of a Humourous Poet* (1602), a robustly satirical answer to Ben Jonson's *Poetaster,* in which Dekker himself was caricatured; and *The Honest Whore, or A Converted Courtesan* (Part 1, 1604; Part 2, 1630), a brilliant, tragicomical commentary on London morals. *The Witch of Edmonton* (in collaboration with John Ford, 1621), a tragedy, was much ahead of its time in its protest against the persecution of witches. The most famous of Dekker's pamphlets were *The Gulls Hornbook* (1609), a hilarious satire which purported to provide a code of manners for proper young fops and their hangers-on; *The Wonderful Year* (1603), a vividly realistic account of the days of the plague; and *The Raven's Almanac* (1609), ridiculing the almanac-making prophets of the day.

Dekker has been called a hack—and a constant fight with poverty and debtor's prison did keep him grinding out drama and verse at an almost unbelievable rate—but there can be found among his lyrics some of the most enchanting poetry of the Elizabethan era. His plays and pamphlets contain lively descriptions of contemporary manners and portraits of the people of Elizabethan London.

DE KOVEN, HENRY LOUIS REGINALD, 1859–1920, U.S. composer, was born in Middletown, Conn., and was educated at Oxford University and on the Continent. The first of De Koven's many light operas, *The Begum,* was produced in 1887 followed by *Don Quixote* (1889). His most successful work, *Robin Hood,* was presented in Chicago in 1890 and had some 3000 successive performances in the United States. It appeared in London in 1891 as *Maid Marian.* One of his best known songs, "Oh Promise Me," is in the *Robin Hood* score. De Koven was also a music critic, first in Chicago and later in New York City. In 1902 he organized the Washington Philharmonic Orchestra, which he conducted for a time. His grand operas, the *Canterbury Pilgrims* (1917) and *Rip Van Winkle* (1920), were not successful; De Koven's

gift for gay, melodic music found its best expression in light opera. He also wrote many piano pieces and over 100 songs, including music for Rudyard Kipling's poem, "Recessional."

DE KRUIF, PAUL, 1890– , U.S. bacteriologist, author, and medical crusader, was born in Zeeland, Mich., and first achieved prominence through his research in gas-gangrene antitoxins during World War I. He is best known, however, for his many popular books on medical practice and research. Critics of his popular works have accused Dr. De Kruif of sensationalism. His works include *Our Medicine Men* (1922), *Microbe Hunters* (1926), *Men Against Death* (1932), *Why Keep Them Alive?* (1938), *The Male Hormone* (1945), and *Life Among the Doctors* (1949).

DELABORDE, HENRI, COUNT, 1811–99, French painter and art critic, was born in Rennes. He is best known for the critical study *Ingres* (1870), and for a history of the Académie des Beaux-arts published in 1891.

DELACROIX, FERDINAND VICTOR EUGÈNE, 1798–1863, French painter of historical and idealistic scenes, radical colorist and leader of the romantic school, was born in Charenton. Almost from infancy he was devoted to music and drawing. At 16 he was left fatherless and thereafter spent most of his time alone. After an early grounding in classical studies, he entered the School of Fine Arts in Paris, where he studied with Baron Guérin, a conservative painter. He spent much time copying masterpieces in the Louvre, to which he was attracted by the Venetians and by Rubens. Delacroix's *Barque of Dante*, done in his early twenties, became a center of controversy when it was accepted in the annual salon of 1822: its theme was the usual classical subject taken from literature, but its treatment was anti-classical in spirit. The experimental manipulation of planes and the instinct for tension in this work was rarely equaled again even by Delacroix himself. Striving for a restoration of the color and rhythm of the Venetians, Delacroix painted the *Slaughter at Chios* in 1824. *Liberty Leading the People* (1830) demonstrated Delacroix's sympathy for the emotionalism and grandiosity of popular revolution (though he hated "the mob," and in 1848 some of his work was burned by a frenzied populace). Like Lord Byron, he was a friend of the Greeks in their struggle for independence and this theme appears in some of his works. In 1832 he made an important trip to Morocco, and subsequently used many Oriental themes in paintings and sketches filled with color and great movement. As Delacroix became increasingly less conservative in his choice of subject matter, his brushwork became freer, his color more vibrant; the impressionists owed much to Delacroix, a pioneer in the search for new color harmonies and technical freedom.

Official recognition was finally accorded him when at 49 years of age, he was elected to the Academy of France. He executed several murals, notably in the Chamber of Deputies and in St. Sulpice. At the salon of 1855 he exhibited 36 works and scored a personal triumph. In his famous *Journals*, one of the most important autobiographical accounts ever written by an artist, he recorded his impressions, his experiments in color and technique, and his philosophy of art. See ROMANTICISM. ANTHONY KERRIGAN

***The Lion Hunt*, an oil by Delacroix typical of his vivid portrayal of animals and hunts, was painted after his trip to Morocco in 1832 with a French military mission.**
ART INST. OF CHICAGO

DELAGOA BAY, inlet of the Indian Ocean, S Mozambique; about 50 miles long and 20 miles wide. It is partly protected by a finger of land projecting from its southern shore and by Inhaca island at the entrance to the bay. The Komati, Umbeluzi, and Pongola rivers drain to Delagoa Bay. Lourenço Marques, the capital of Mozambique (see MOZAMBIQUE), is located on the western shore of the bay; which was discovered in 1502 by the Portuguese Antonio do Campo, a member of Vasco da Gama's expedition. Portuguese, British, and other trading posts were established around the bay after the eighteenth century. Portugal established its claim to the coastal area in 1875.

DELAHANTY, EDWARD JAMES, known as Big Del, 1870–1903, U.S. baseball player, member of the Baseball Hall of Fame, was born in Cleveland, Ohio. Starting his career with the Philadelphia Phillies in 1888, he was the only hitter ever to lead the two major leagues in batting; the National in 1899, and with Washington in the American in 1902. An outfielder, he had a lifetime batting average of .346.

DE LA MARE, WALTER JOHN, 1873–1956, English poet and novelist, was born in Charlton, Kent, and was through his mother, Lucy Sophia Browning, related to Robert Browning. At the age of 16 De la Mare became a statistical clerk for an insurance company, but spent his spare time in literary activities. His first published work, "Kismet," a short story, appeared in *The Sketch* in 1895; he later contributed to the *Cornhill Magazine*. His first book, *Songs of Childhood* (1902), and other early works appeared under a pseudonym, "Walter Ramal," an inversion of his own name. In 1908 the British government granted him an annual pension of £100 and, released from the drudgery of an office, De la Mare produced many novels, short stories, and poems, achieving eminence for sensitive and highly individual work. A master of the fantastic and the macabre, De la Mare also wrote many poems for children. His works include *Henry Brocken* (1904), *The Return* (1910), *The Memoirs of a Midget* (1921), *Collected Poems* (1942), *Collected Stories for Children* (1944), *The Traveller* (1946), *Inward Companion* (1950), *Winged Chariot* (1951), and *Private View* (1953).

DE LAND, city, NE Florida, county seat of Volusia County, on the Atlantic Coast Line Railroad, on U.S. highways 17 and 92; 21 miles SW of Daytona Beach. It is a shipping point in a region of citrus fruit groves, truck farms, and nurseries. It is the seat of Stetson University. Pop. (1950) 8652.

DELANO, JANE ARMINDA, 1862–1919, U.S. nurse, was born in Townsend, N.Y. In 1909, while superintendent of the U.S. Army Nurse Corps, she organized the Red Cross nursing service, of which she became the director in 1911. During World War I she administered the work of the American Red Cross department of nurses, which assigned some 20,000 nurses to the armed forces.

DELANO, city, S Central California, in Kern County, in the San Joaquin Valley, on the Southern Pacific Railroad and U.S. Highway 99; 30 miles NNW of Bakersfield. Delano is located in an irrigated farming region producing cotton, grain, potatoes, grapes, vegetables, and livestock. Industries in the city include cotton ginning and the manufacture of wine, agricultural implements, concrete pipes, wooden

containers, and farm chemicals. Delano was incorporated in 1915. Pop. (1955 special census) 10,328.

DELANY, MARTIN ROBINSON, 1812–85, U.S. Negro leader and first Negro major in the U.S. Army, was born in Charles Town, Va. The son of free Negroes, he was graduated from Harvard University, where as a medical student in 1852 he wrote *The Condition, Elevation, Emigration, and Destiny of the Colored People of the United States, Politically Considered.* Representing the National Emigration Convention which he founded in 1854, Delany explored the valley of the Niger in Africa, 1859. During the Civil War he recruited Negro soldiers, and as an acting surgeon was commissioned major, 1865. A severe critic of the Reconstruction period, he was a trial justice in Charleston, S.C., for four years. Delany was nominated for lieutenant governor of South Carolina in 1874, but was defeated.

DE LA RAMÉE, LOUISE. See Ouida.

DE LA ROCHE, MAZO, 1885– , Canadian novelist, was born in Toronto. She was awarded the *Atlantic Monthly* prize of $10,000 for *Jalna* (1927), part of a series of works about the Whiteoak family, including *Whiteoaks of Jalna* (1929), *The Master of Jalna* (1933), *Young Renny* (1935), *Whiteoak Harvest* (1936), *The Sacred Bullock* (short stories, 1939), *Building of Jalna* (1944), *Mary Wakefield* (1949), *Renny's Daughter* (1951), and *Variable Winds at Jalna* (1954).

DELAUNAY, ROBERT, 1885–1941, French painter, was born in Paris and is remembered as a founder of the movement in painting known as orphism, whose purpose was to liberate cubism by bringing to it more vibrant color and less dependence upon object painting. Delaunay's color theories—also known as color orchestrations and synchronism—greatly influenced the German *Blaue Reiter* school and later expressionist painting. One of his best known works was *Simultaneous Windows* (1911).

DELAVAN, city, SE Wisconsin, Walworth County; near Delavan Lake, on the Milwaukee Railroad; 20 miles ENE of Beloit. The area was settled in 1836 as a temperance colony. Delavan is in a lake resort and dairying area. Knit goods, clocks, cigars, and electrical equipment are manufactured here. It is the site of a state school for the deaf. Pop. (1950) 4007.

DELAVIGNE, JEAN FRANÇOIS CASIMIR, 1793–1843, French poet and dramatist, was born in Havre. His first popular success was *Les Messéniennes* (1815), a verse satire on the restoration of the monarchy. This work made the youthful author famous, and the dramas which followed, such as *Les Vêpres Siciliennes* (1818) and *Les comédiens* (1820), were also warmly received. But *Le Paria* (1821) displeased the king and Delavigne lost his government sinecure. As his political fortunes declined, however, his personal popularity increased, and he was revered during his lifetime as a national poet. His song "La Parisienne," written for the 1830 revolution, was second only to "La Marseillaise" in popularity.

DELAWARE, a tribe of North American Indians of the Algonquian family. Their language is a typical Algonquian dialect. They claim to be the parent stock and call themselves Lenni Lenâpé (genuine or true-born men). In 1664 they occupied New Jersey, and parts of Delaware, Pennsylvania, and New York; it was with the Delawares that William Penn made his famous treaty of 1682. There were three major divisions or subtribes, the Munsee, the Unami, and the Unalachtigo. The Iroquois assumed dominion over them about 1720.

Forced westward by the whites, they settled successively in western Pennsylvania, Ohio, Indiana, Missouri, Arkansas, Texas, and Kansas, moving from a Kansas reservation in 1867 to the Cherokee nation in Indian Territory. Large numbers of Delawares were converted by Moravian missionaries in the seventeenth and eighteenth centuries. Most of the nation is now in Oklahoma, but there are scattered groups in Kansas, Wisconsin, and Ontario.

DELAWARE STATE DEVELOPMENT COMM.

This monument by Milles at Fort Christina State Park in Wilmington, Del., was donated by Sweden in 1938 to mark Fort Christina's settlement by Swedes 300 years earlier.

DELAWARE, an E coastal state of the United States, on the Delmarva Peninsula; bounded on the N by Pennsylvania, on the E by the Delaware River, Delaware Bay, and the Atlantic Ocean, and on the S and W by Maryland; area 2057 sq. mi., including 79 sq. mi. of water, ranking 49th among the states in area; pop. (1950) 318,085, ranking 47th among the states. Delaware extends about 100 miles from north to south and varies in width from 9 to 35 miles east to west. The state received its name from Thomas West de la Warr, governor of the colony of Virginia. Its nickname, Blue Hen State, was derived from the blue fighting cocks for which it was once famous. The state was called the Diamond State by a Delaware poet, John Lofland, who referred to it as "diminutive, but having within it inherent value." The state motto is "Liberty and Independence." For state flag in color, see Flag. Delaware is one of the 13 original states. The capital is Dover. See map in Atlas, Vol. 20.

Physical Factors

Topography. Most of the state is in the embayed section of the Atlantic coastal plain, an area that is partially submerged and only slightly eroded. It is underlaid with Cretaceous and Tertiary sediments and covered to a depth of 25 feet with unconsolidated Pleistocene gravel and sand. The older sediments are exposed in a few scattered places. The coast line has sandy beaches, lagoons, and many marshes. The Great Pocomoke Swamp, covering about 30,000 acres, is a fresh-water area that crosses the south central boundary into Maryland. Most of the state is level to gently rolling. A sandy ridge, extending from the northwest to the south central boundary, nowhere more than 85 feet high, divides the drainage between Chesapeake Bay and the coastal area of the Delaware River. The area north of a line running southwest from Wilmington is in the upland area of the Piedmont, a region of pre-Cambrian rocks covered with patches of coarse red Pliocene gravel and sand. A greater amount of relief is in this small hilly section. The highest point in the state is a hill at Centerville,

with an elevation of 440 feet, from which almost all the small streams flow southeastward into the Christina River.

Coasts, Rivers, and Lakes. The entire eastern boundary of Delaware is a coastal area. The smooth coast line and the broad nature of the river are indicative of a drowned river mouth. The bay area was actually once a part of the river. Submergence of the original coastal area is marked by the number and frequency of swamp areas and lagoons, locally known as bays, along the present coast. The principal rivers are the Nanticoke in the southwest and the Christina in the northeast; others are the Smyrna, the Leipsic, the St. Jones, the Murderkill, the Mispillion, and the Indian, all flowing eastward into coastal waters. There are more than 50 small freshwater lakes evenly distributed in the coastal plain.

Climate and Soils. The climate of Delaware is classified as humid subtropical, except in the extreme north. Average annual temperatures range from 56°F in the northwestern part of the state to 53°F in the southeast. The mean temperature for January is 36°F, for July, 77°F. The average annual precipitation is 43 inches, well distributed throughout the year. Snowfall and drought are rare. The prevailing winds during the winter are from the north and west; during the summer they are from the south and east, with frequent moist ocean breezes. The growing season ranges from 180 days in the north to 195 days in the south, with the frost-free season usually extending from about April 15 to October 25.

The soils of Delaware vary from sandy to clay loams and are alluvial and residual. Most of New Castle County and the northern two-thirds of Kent are covered predominantly with clay loam. South Kent County and most of Sussex have sandy loams.

Natural Vegetation and Animals. When Delaware was first settled it was densely forested with pine, oak, walnut, hickory, and yellow poplar, but the land was rapidly cleared. The tall white oak, especially prized by early shipbuilders, is now protected. Other common trees are the black, pin and red oaks, walnut, ash, sycamore, beech, maple, and chestnut. Occasionally the laurel, persimmon, sassafras, and wild cherry are found. The south has sweet gum, loblolly pine, and bald cypress. Mistletoe, once common, is becoming scarce. The magnolia, sweet pepper bush, high bush huckleberry, and cranberry are common, and pitch pine, willow, cedar, myrtle, and orchids are found in the swamps and sandy areas of the south.

Upland game—rabbits, squirrels, deer, doves, woodcocks, pheasant, and quail—exists in moderate quantities throughout the state. Other animals are the mink, otter, muskrat, mole, chipmunk, and fox. Small birds include the wren, oriole, wood thrush, meadow lark, cardinal, robin, bluejay, and several species of warbler. The bald eagle, great blue heron, and snowy egrets exist in limited numbers. Snakes include the pine, copperhead, and spreadhead, and snapping turtles are found in the swamps. Since the Delaware River is along the eastern flyway, 12,000 acres on the east central coast were set aside in 1937 as the Bombay Hook Migratory Waterfowl Refuge.

Social Factors

Population. The 1950 census tabulated a population of 318,085 in Delaware. About 62.5 per cent was classified as urban, the rest as rural. Wilmington with 110,356 persons had more than one-half the total urban population. New Castle County (which includes Wilmington), in the northern part of the state, had about two-thirds of the state's population. The rest was fairly evenly distributed between the state's other two counties, Kent and Sussex. The population is largely a homogeneous colonial stock, with a number of Negroes (43,598) scattered throughout the state. A large immigrant element is found in the Wilmington area.

DELAWARE STATE DEVELOPMENT DEPT.

Old Swedes Church in Wilmington, built in 1698, is one of the oldest Protestant churches in North America. It was used continuously for a period of more than 250 years.

PRINCIPAL CITIES

	POPULATION 1955 Estimate	1950 Census
Wilmington	117,800	110,356
Newark	7,800	6,731
Dover (capital)	7,500	6,223
New Castle	5,500	5,396
Elsmere	5,500	5,314
Milford	5,400	5,179

Education and Public Welfare. The state board of education, appointed by the governor, selects the state superintendent of education, who is in charge of the administration of public schools. Education is compulsory for all between the ages of 6 and 14. The 1954–55 enrollment for elementary schools totaled 35,372, and for secondary schools, 22,549. There were 2515 instructors in the school system. The expense per pupil in average daily attendance was $335 in 1954. The University of Delaware, at Newark, founded in 1743, and Delaware State College, at Dover, 1891, are the only institutions of higher learning. There were 5119 college students in 1954.

The charitable and correctional institutions in Delaware include the State Training School for the Feeble Minded at Stockley, the Blind Shop and the Detention Home for Juveniles at Wilmington, the State Hospital at Farnhurst, the Industrial School for Girls at Claymont, the State Welfare Home at Smyrna, the Brandywine Sanatorium, the Edgemont Sanatorium, and the Industrial School for Colored Girls and the Industrial School for Boys at Marshallton. Delaware, in July 1955, became the last state to establish a state prison system. The whipping post is still maintained for punishment of certain crimes.

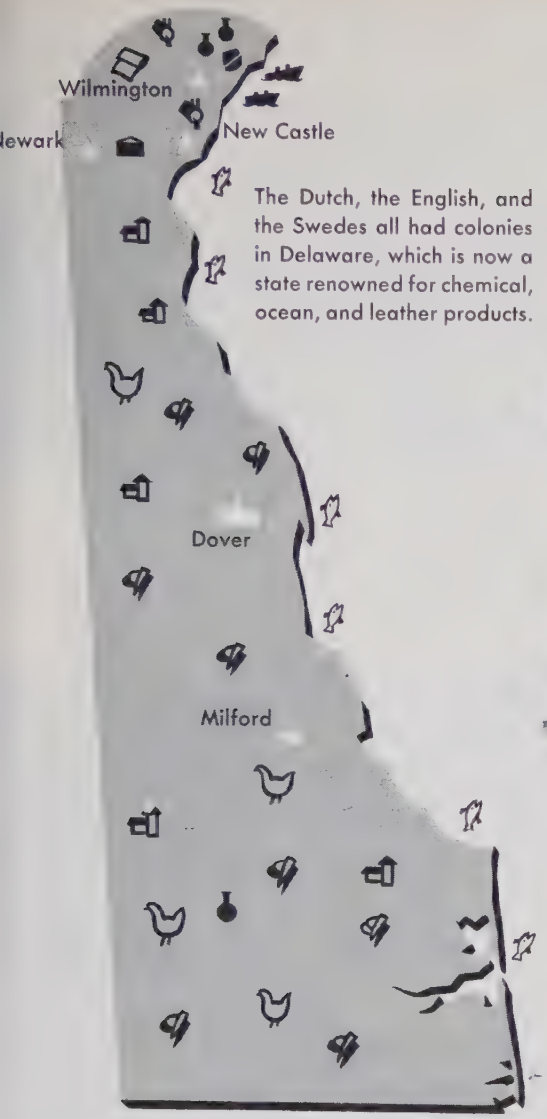
Economic Factors

Agriculture. There were 7448 farms in Delaware in 1950, with a total acreage of about 851,000. The northern part of the state is devoted to general farming and dairying, the central and southern parts to fruits and garden vegetables. Corn, wheat, and soy-

PRINCIPAL CROPS OF DELAWARE

CROP	UNIT (thousands)	1944–1953 Average	1954	1955
Apples	Bushels	361	280	220
Barley	Bushels	320	341	396
Corn	Bushels	4992	5332	5100
Hay	Tons	102	100	103
Peaches	Bushels	204	116	105
Potatoes	Bushels	582	2002	2990
Rye	Bushels	238	264	270
Soybeans	Bushels	762	1190	1482
Sweet Potatoes	Bushels	102	52	58
Wheat	Bushels	1152	840	858

DELAWARE



The Dutch, the English, and the Swedes all had colonies in Delaware, which is now a state renowned for chemical, ocean, and leather products.

Chemical Industries

State Tree
American Holly

State Bird: Blue Hen

State Flower
Peach Blossom

PRINCIPAL PRODUCTS

- Seafood
- General farming
- Textiles
- Rubber
- Shipyards
- Steel industry
- Vegetables
- Poultry
- Chemical industry
- Oil refining

Coat of Arms

State Capitol: Dover

State Flag

State Seal

beans are grown in the north. Potatoes, apples, and peaches are important in the central and southern parts of the state. Tomatoes, beans, peas, asparagus, cucumbers, and melons are major truck crops. The poultry industry has become very important. In 1954 there were 69.8 million broilers marketed for $48.9 million. There are a few beef cattle and hogs scattered throughout the state. The total value of farm products sold in 1950 was $76.2 million.

Mining and Fisheries. The mineral industries constitute only a small portion of the total industrial wealth of the state. The average annual total value of mineral production in Delaware for the years 1945–50 was $346,000. For 1952 the total was $677,000. The only commercial products are sand, gravel, and clay. In New Castle County clay is used for brick and tile manufacture. Small deposits of bog iron supplied local furnaces until 1890.

Delaware Bay and the Atlantic Ocean are excellent fishing grounds. The bay yields clams, crabs, oysters, lobsters, and other shellfish. Lewes and Rehoboth Beach have shad, herring, and menhaden fishing fleets.

Manufacturing and Commerce. The principal manufacturing district in the state is around Wilmington. It is the home of E. I. du Pont de Nemours and Co., Inc., one of the world's largest manufacturers of chemicals and allied products, founded as a powder mill in 1802. Glazed kid and morocco leather, braided rubber hose, dyed cotton goods, and ships are also produced at Wilmington. Manufactures of the surrounding towns are pigments, chemicals, vulcanized fiber, petroleum products, rayon, steel, and airplanes. Seaford produces synthetic fibers, and Milford manufactures dental supplies. Most of the towns in the central part of the state process foods and make baskets and crates. Lewes produces oil and fertilizer from fish. The total number of people employed in manufacturing in 1953 was 58,550. The value added by manufacturing was $378,975,000, about 70 per cent from New Castle County. The principal products manufactured were chemicals, $101,297,000; transportation equipment, $50,988,000; primary metals, $25,703,000; textiles, $15,392,000; and leather and leather products, $10,851,000. Wages and salaries paid during the year totaled $255,801,000.

Transportation and Communication. Wilmington, the principal port in Delaware, has a marine terminal with facilities for ocean vessels. New Castle and Lewes have port facilities for smaller ships. The 19-mile Chesapeake and Delaware Canal, connecting the Delaware River with Chesapeake Bay, was originally opened in 1829 and purchased by the federal government in 1919. Subsequent improvements made the canal 27 feet deep and 250 feet wide. It is part of the intracoastal waterway. The Baltimore and Ohio and the Reading railroads serve only the northern part of the state, and the Pennsylvania Railroad operates throughout most of the state. U.S. Highway 13 runs the length of the state and U.S. Highway 113 extends from Dover to the southeast. The northern part of New Castle County is served by U.S. highways 40 and 202. The Delaware Memorial Bridge, one of the longest (10,765 ft.) single suspension bridges in the world, was built in 1951. It crosses the Delaware River to New Jersey just north of New Castle. Wilmington is a scheduled airline stop.

E. I. DU PONT DE NEMOURS & CO.

Nylon yarn is baked in large twist-setting ovens, like the one pictured, before being wound on spools and cones for inspection and shipment from the Du Pont plant at Seaford.

Tourist Attractions. A variety of scenery may be enjoyed from the hilly woodlands of the industrial north to the sandy coastal areas of the agricultural south. Swimming, hunting, fresh and salt water fishing, picnicking, camping, and hiking may be enjoyed. The state operates several forest and recreational sites, chiefly in southern Delaware. Many tourists are interested in the historic colonial landmarks and collections in Delaware. In Wilmington are old Swedes Church (1698) and Fort Christina State Park, commemorating the site of the Swedish settlement founded here in 1638. Nearby is the Henry Francis du Pont Winterthur Museum, which contains more than 100 period rooms, 1640–1840. The east wing of the New Castle courthouse, built about 1682, is believed to be one of the oldest continuously occupied public buildings in the United States. Also in New Castle are Immanuel Church, built in 1704, and Amstel House, a colonial museum. In Dover the State House, 1792, is the second oldest in use in the United States. The Delaware State Museum is housed in the Presbyterian Church built in 1790. Zwaanendael Museum in Lewes is a reproduction of the town hall of Hoorn, Netherlands, commemorating the original Dutch colony founded at Lewes in 1631.

Administrative Factors and History

Government. The government of Delaware is administered under the constitution adopted in 1897; earlier ones were adopted in 1776, 1792, and 1831. The executive officers include the governor, lieutenant governor, attorney general, secretary of state, state treasurer, and state auditor. All serve four-year terms except the state treasurer and the state auditor, who are elected for two years. The governor may serve only two terms.

The general assembly meets in odd years and has no definite length set for its sessions. The senate has 17 members, elected to four-year terms, the house of representatives, 35 members serving two-year terms.

The governor's veto power may be extended to separate items in appropriation bills, and a three-fifths majority vote by both houses is needed to override his veto. An amendment may be proposed in either house and becomes valid if it passes by a two-thirds vote of each house in two successive sessions. Delaware is the only state where the voters do not have to approve a constitutional amendment. A constitutional convention may be called by a two-thirds vote in both houses, provided a majority of the electorate concur. The state has one representative and two senators in Congress.

The constitutional prohibition against taxing stock of companies owned by nonresidents but incorporated in Delaware has encouraged a large number of companies to incorporate in the state. Most of these firms possess no physical operations within the state.

Judiciary and Voting Requirements. The judicial power of Delaware is vested in the supreme court, the superior court, the court of chancery, the common

DELAWARE

Highlights of History

The first permanent settlement in the Delaware Valley was at Wilmington, by a Swedish-Dutch expedition, 1638.
AMERICAN SWEDISH HISTORICAL MUS.

Delaware was part of Pennsylvania for a brief period when William Penn, right, arrived at New Castle in 1682.
STANLEY M. ARTHURS

HISTORICAL SOC. OF DELAWARE
Cooch's Bridge monument near Newark marks the only Revolutionary War battle fought on Delaware soil, 1777.

WILLARD S. STEWART FOR FWP
Fort Delaware was built on Pea Patch Island in the Delaware about 1852 to replace earlier fortifications of 1814.

The first Du Pont chemical laboratory near Wilmington was housed in this old saltpeter refinery on the Brandywine.
E. I. DU PONT DE NEMOURS & CO.

HIST. SOC. OF DELAWARE

Zwaanendael House in Lewes, Del., an adaptation of part of the town hall of Hoorn, Holland, contains many exhibits reminiscent of colonial Lewes and lower Delaware.

pleas courts, registers' courts, and county family and juvenile courts.

Suffrage in the state is limited to U.S. citizens who are over 21 years old, have been state citizens for a year, and who can read the state constitution in English and write their own names.

Colonial History. The region was included in the British claim as part of Virginia. The Dutch, by virtue of the discovery of the Delaware River by Henry Hudson in 1609, also claimed the area and in 1631 established a fur trading post near the present town of Lewes. Algonquin Indians destroyed the post after their hostility had been aroused by the settlers.

The first Swedish settlement, Fort Christina, was made in 1638 under Peter Minuit near the present site of Wilmington. It included many Finns. The surrounding area was called New Sweden and the settlers' claim was based on a purchase from the Indians. The Dutch under Peter Stuyvesant, who had obtained a claim through another purchase from the Indians, founded Fort Casimir near New Castle in 1651. Fort Casimir was taken by the Swedes in 1654, but in the following year it and Christina were captured by the Dutch.

The Dutch colonies fell to the British in 1664 and Delaware remained in their hands until the American Revolution, with the exception of a brief interval, 1673–74, when the Dutch regained control. During this interval of Dutch rule three districts, laying the basis for the three counties, were established. The Duke of York (later James II) held the grant of the area until 1682 when he deeded the territory to William Penn. It was held by the Penns as proprietors along with Pennsylvania, but a separate governor was appointed for the area in 1692 and a separate assembly convened in 1704. The long dispute over the northern boundary was finally settled by George III in 1769 when he proclaimed that it should follow an arc of 12 miles' radius from the New Castle courthouse spire. The only battle of the Revolution fought in Delaware was at Cooch's Bridge, near Newark, Sept. 3, 1777. Delaware was the first state to ratify the U.S. Constitution, Dec. 7, 1787.

Statehood. The first state constitution, 1776, contained two items of interest that were not included in the second constitution, 1792. Suffrage was awarded to freeholders "who owned 50 acres of land, with 12 acres of it cleared and improved, or those who were otherwise worth 40 pounds lawful money." It also held that no slave could be imported into the state from Africa to be held in slavery, and that no slaves could be brought into the state for sale from any port in the world. During the War of 1812 the port of Lewes was bombarded by the British. Regular steam rail passenger service in the United States was established on the New Castle and Frenchtown Railroad in 1832. It connected steamboat service on the Delaware River with that of Chesapeake Bay.

During the Civil War there was a considerable amount of pro-slavery sentiment, especially in the southern part of the state. Though the official state government remained loyal to the Union, men from Delaware fought for both sides. Industry developed rapidly after the war. Delaware was without full representation in the U.S. Senate for most of the period from 1901 to 1906 because of deadlocks in the assembly. The Delaware River dispute between Delaware and New Jersey over the possession of oyster beds was finally settled by the U.S. Supreme Court in 1934. Delaware was awarded the beds to the limit of the low-water mark on the New Jersey shore within a 12-mile radius of New Castle. Farther down the river the boundary was set at the center of the ship canal, not the geographic center. W.D.

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DELAWARE, city, central Ohio, county seat of Delaware County, on the Olentangy River, on the Chesapeake and Ohio, the New York Central, and the Pennsylvania railroads and U.S. highways 23, 36, and 42; 23 miles N of Columbus. The city, which was founded in 1808 on the site of a Delaware Indian village, was the birthplace of Pres. Rutherford B. Hayes. Delaware's manufactures include truck bodies, machinery, rubber products, and stoves. It is the seat of Ohio Wesleyan University. Pop. (1950) 11,804.

DELAWARE, UNIVERSITY OF. The University of Delaware at Newark, Del., grew out of the Newark Academy established in 1743. Collegiate instruction for men began in 1833 when Delaware College was chartered; the college was designated in 1867 as a beneficiary of the Morrill Act and in 1870 became the land-grant college of the state of Delaware. By

Brown Laboratory is one of the most picturesque buildings on the Delaware campus. The engineering school began in 1870, the year the university became a land-grant college.

UNIV. OF DELAWARE

an act of the state assembly, the institution became a state college in 1913 and a state university in 1921. A women's college was established by the state on the same campus in 1914. In 1944 administrative reorganization completely merged the two institutions into a university with six schools: agriculture, arts and sciences, education, engineering, home economics, and graduate studies. Graduate enrollments are heavy in proportion to undergraduates. Adult education is provided by university extension programs and rural education through agricultural extension service. Extensive research is carried on through the agricultural experiment station, and under the sponsorship of the government, industries, and foundations. See COLLEGES AND UNIVERSITIES; MORRILL ACT.

DELAWARE AQUEDUCT. See AQUEDUCT.

DELAWARE BAY, an arm of the Atlantic Ocean between New Jersey and Delaware. The width at the entrance, between Cape May and Cape Henlopen, is about 11 miles; the maximum width, about 25 miles. The bay is approximately 40 miles in length and tapers gradually to the estuary of the Delaware River. Its total area is about 665 square miles. Delaware Bay is connected to Chesapeake Bay by the Chesapeake and Delaware Canal.

DELAWARE RIVER, E United States, rises in the Catskill Mountains, SE New York, and follows a southerly course, forming part of the boundary between New York and Pennsylvania to Port Jervis, N.Y. and the entire boundary between New Jersey and Pennsylvania. It becomes tidal at Trenton, the head of navigation, and below Philadelphia and Camden, N.J., widens gradually into Delaware Bay. The total length is 367 miles; the drainage basin is 12,300 square miles. The Lehigh and Schuylkill rivers from the west and the Mongaup and Neversink from the east are the most important tributaries. Major bridges are at Philadelphia, Wilmington, and Bristol. There are several canals connecting the river with other waterways, including the Chesapeake and Delaware Canal. Early canals were the Delaware and Raritan, 1834, and the Delaware and Hudson, 1828, both now abandoned. The Delaware has been compared with the Clyde River in Scotland because of the shipbuilding industries along its banks. The channel has been deepened to 25 feet between Trenton and Philadelphia and to 35 feet from Philadelphia to Delaware Bay. The river flows through extensive manufacturing regions, rich farm land, and important anthracite areas. Discovered by Hudson in 1609 and later explored by Cornelius Jacobsen May, it was named for Thomas West de la Warr, governor of Virginia. The Delaware Water Gap, a gorge formed when the river breaks through the Kittatinny Mountains near Stroudsburg, Pa., is famous for its beauty. Washington Crossing state parks, nine miles up the river from Trenton, mark the spot where Gen. George Washington crossed the river on Christmas eve, 1776. See WASHINGTON, GEORGE; CLYDE RIVER.

The Delaware Memorial Bridge at Wilmington is one of the world's longest single suspension bridges. It connects Delaware with the New Jersey Turnpike seen in background.
DELAWARE STATE DEVELOPMENT DEPT.

DELAWARE WATER GAP. See DELAWARE RIVER.

DE LA WARR, THOMAS WEST, 3rd or 12th BARON, known as Lord Delaware, 1577–1618, colonial administrator in America, was born in England. He is called the 12th Baron de la Warr if his title is reckoned from Roger de la Warr (died ?1320) or, more properly, the 3rd Baron if the reckoning dates from Reginald West (1394–1451), 3rd Lord West, who became Baron de la Warr in 1426, and is called "second founder" of the family. Appointed to the council of the Virginia Company in London, 1609, Thomas became governor and captain general of Virginia, 1610. In June of the same year he arrived at Jamestown just in time to prevent the colonists from deserting the settlement. Having established order, De la Warr built Fort Henry and Fort Charles, returning to England in 1611 to seek support for the colony. He died on a second voyage to Virginia.

DELAYED REACTION. See CONDITIONED RESPONSE.

DELCASSÉ, THÉOPHILE, 1852–1923, French political leader and diplomat best known for his part in arranging the *Entente Cordiale* with Great Britain, was born in Pamiers, Ariège. He entered the chamber of deputies in 1899 and served as foreign minister until 1905. He was later naval minister, ambassador to Russia and during World War I served as minister of national defense until his failure to bring Bulgaria to the aid of the Allies forced him to resign.

DELEDDA, GRAZIA, 1875–1936, Italian writer, was born in Nuoro, Sardinia. After her marriage in 1900 she lived in Rome, but most of her writing was set against a Sardinian background. She wrote her first novel, *Fior di Sardegna*, at the age of 15. Her realistic and emotionally convincing works were brightened with humor but often jolting in their violence; her lifelong effort to depict the tragic conflict between idealism and the harsh realities of life is most powerfully exemplified by *La fuga in Egitto* (The Flight into Egypt, 1926), the novel for which she was awarded the 1926 Nobel prize for literature. A member of the Italian Academy of Immortals, she wrote some 30 novels and numerous short stories and poems. Her works include *Dopo il divorzio*, 1902 (*After the Divorce*, 1905), *Cenere*, 1903 (*Ashes*, 1908), *Canne al vento* (*Reeds in the Wind*, 1913), *La Madre*, 1920 (*The Mother*, 1922), and *Annalena Bilsini* (1928).

DELEGATION OF AUTHORITY. See AGENCY.

DELEGATION OF POWERS, the authorization by law of a person or body of persons to act as agent or representative for a higher political authority. It usually consists in the creation of a subordinate law-making body, or of a person with administrative authority, to whom legal powers are entrusted with a prescribed amount of discretion in their use. Judicial review is generally prescribed in the act creating the authority to determine if the use is in accordance with the provisions of the law delegating the powers. Judicial power, unlike executive and legislative power, cannot be delegated, although the appointment of commissioners by the United States courts and of masters in chancery by the state circuit courts is somewhat analogous to delegation.

DE LEON, DANIEL, 1852–1914, U.S. Socialist leader, was born on the island of Curaçao. After studying in Germany and Holland he went to New York City in 1874. De Leon joined the Knights of Labor, 1888; Edward Bellamy's nationalist movement, 1889; and the Socialist Labor party in 1890, becoming editor of its weekly, *The People*, in 1892. In 1895 he organized apostates of the Knights of Labor into the Socialist Trade and Labor Alliance. He was the Socialist Labor candidate for governor of New

York in 1891 and 1902, and unsuccessfully for Congress several times. Characterizing leaders of existing trade unions as "labor fakers," he called for the reorganization of unions on an industry and socialist basis. After losing control of the Socialist Trade and Labor Alliance, which eventually became the Socialist Party of America, De Leon helped to form the Industrial Workers of the World, 1905. He left that group in 1908 to establish the Workers' International Industrial Union. His writings were said by Nikolai Lenin to contain the germ of the Soviet system. They include *What Means This Strike?* (1898), *Two Pages from Roman History* (1903), and *Socialist Reconstruction of Society* (1905).

DELESCLUZE, LOUIS CHARLES, 1809–71, French political figure, was born in Dreux. A leader in the revolutionary uprisings of 1830, 1848, and 1870, Delescluze was frequently in prison or in exile. In 1868 he founded the *Réveil*, a revolutionary paper. A leader of the commune in 1871, he tried to organize a successful resistance against government troops; seeing that the situation was hopeless, Delescluze threw himself into the line of fire directed at a barricade and was killed.

DELFI. See Delphi.

DELFSHAVEN or **DELFTSHAVEN,** town, W Netherlands, in the province of South Holland, on the Maas River; a SW suburb of Rotterdam. Delfshaven was the port from which the Pilgrims embarked for the new world on July 22, 1620. Pop. about 9000.

DELFT, town, W Netherlands, in the province of South Holland, on the Schie River, 6 miles SE of The Hague. An industrial town, Delft is especially noted for its porcelain and tile industries (see Delftware). Other manufactures are glassware, paint, machinery, dyes, and leather goods. In the town is a thirteenth century church, Oude Kerk, containing the tombs of Admirals Maarten Tromp and Piet Hein. A noted landmark is the Oostpoort bridge. The fifteenth century Gothic church contains the tombs of Hugo Grotius and William the Silent. The latter was assassinated here in 1584. Delft is also the birthplace of the painter, Jan Vermeer, who spent his entire life in the city. During the seventeenth century Delft became famous for its ceramic and china industries. Pop. (1953) 67,186.

METROPOLITAN MUS. OF ART

A Tin-enameled Earthenware Delft Plate Dated 1758

DELFTWARE, a type of glazed earthenware pottery which originated in the Netherlands town of Delft during the early part of the seventeenth century. Of exceptionally high quality and fine craftsmanship, early Delftware was much prized by connoisseurs of ceramics for its beautiful coloring—characteristically blue and white—and charming decorations, which were often Dutch landscapes and marine scenes. Delftware was much imitated throughout Europe, particularly in England. See Pottery.

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Tall minarets flank the picturesque Jama Masjid in Delhi. Built by the Mogul Emperor Shah Jahan in the seventeenth century, it is the largest mosque in the Indian republic.

DELFZIJL, town, NE Netherlands, in the province of Groningen, at the confluence of the Eems Canal with the Eems Estuary; 17 miles ENE of Groningen. Delfzijl is a port and trading center, exporting dairy and agricultural products. Local manufactures include soda ash, chemicals, salt, sugar, and cement. Delfzijl is also a shipbuilding center. Pop. (1950) 10,935.

DELHI, centrally administrative territory, NW India, bounded by the states of Punjab on the N, S, and W and Uttar Pradesh on the E; area 578 sq. mi.; pop. (1951) 1,744,072. The territory is drained by the Jumna River system. It has a tropical savanna climate, with a dry season from October to May and a wet monsoonal season from June to September. The annual rainfall is 27 inches; the mean temperature is 92°F in June and 58°F in January. The soil is of alluvial origin. Barley, millet, gram, wheat, and sugar cane are produced under irrigation. The region has a large urban population, about one-third of it in the New Delhi–Delhi area. New Delhi is the capital of the Indian republic, and Delhi is the capital of the territory. Most of the people speak Hindustani. Punjabi and English are also spoken. Delhi state was created in 1912 from a part of Punjab; in 1915 an adjacent tract of land was added from the United Provinces. Delhi, a chief commissioner's province while India was under British rule, became a state after India became independent. By the Indian reorganization of states on Nov. 1, 1956, Delhi was designated a centrally administered territory in the republic.

DELHI and **NEW DELHI,** cities, NW India, in the centrally administered territory of Delhi, on the west bank of the Jumna River; 800 miles WNW of Calcutta and 730 miles NNE of Bombay. New Delhi is the capital of the Republic of India. Together these cities form the largest inland urban area of India. Pop. (1951) Delhi, 914,790; New Delhi, 276,314.

Economic Life. Delhi, or Old Delhi, on the north, a trading center, and New Delhi on the south, the national administrative and governmental center, function as one city. As a result of great industrial and commercial development, the cities became the distributing center for the whole of northern India. They are connected by rail and air with Bombay, Calcutta, and Madras and are a scheduled international airline stop. Industrial products include cotton goods, flour, textiles, paint, rubber goods, jewelry, gold and silver embroidery, carved ivory work, pottery, brass utensils, wire netting, hats,

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Delhi's famous Red Fort, built of red sandstone, contains audience halls and a seventeenth century imperial Mogul palace. It once held the noted jeweled Peacock Throne.

leatherware, and hardware. The commercial center for textiles, banking, and general merchandise in Delhi is Chandni Chowk; for brass utensils and hardware, Chawri Bazar; for building materials, Lal-Kuan Bazar; and for general merchandise, Sadar Bazar. Khari Bawli is the granary center of Delhi, with its adjacent streets specializing in food trading. The chief shopping center in New Delhi is Connaught Place. Delhi is the seat of Delhi University and numerous affiliated colleges and institutes.

Points of Interest. A high stone wall, built by emperor Shah Jahan in 1638, surrounds the old city. On its river frontage is Red Fort, enclosing a seventeenth century Mogul palace built by Shah Jahan. It is noted for its public audience hall (Diwan-i-Am) and its private audience hall (Diwan-i-Khas), built entirely of white marble and inlaid with precious stones. On the banks of the Jumna River is Rajghat Samadhi, where Mahatma Gandhi's body was cremated on Jan. 31, 1948, now an Indian shrine. The Jama Masjid, or great mosque, built in the seventeenth century, is made of red sandstone inlaid with white marble. Another noted mosque is the Moti Musjid, built by Aurangzeb. The Kutab Minar, a beautiful 238-foot tower, was built in the thirteenth century to commemorate the victories of the Mohammedan general Kutb-ud-din. Several tombs are located to the south, the most important being those of Humayun, Isa Khan, and Safdar Jang. The president's house, or Rashtrapati Bhaven, and the parliament building are located in New Delhi. In the new city are the ruins of an observatory, Jantar Mantar, built by a Rajput astronomer. On the west edge of Connaught Place is the Indian Gate, or War Memorial Arch.

Pictured is the spacious loggia connecting the ballroom and dining room in Government House, New Delhi, residence of the presidents of the Republic of India since 1950.

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History. There have been eight cities of Delhi, sometimes one upon another, sometimes one beside another. From the first Delhi, called Indraprastha, to the present Delhi, sometimes called Shahjahanabad, the area has been the site of capital cities. In 1192 Delhi was captured by Kutb-ud-din, who made it the capital of the Moslem state in 1206. Tamerlane (see TAMERLANE) sacked the city in 1398. Local rulers continued to govern until the Mogul conquest in 1526 when Baber (see BABER) captured Delhi and made it the capital city of the Mogul empire. After the death of Aurangzeb in 1707 the empire began to lose its power. In 1739 Delhi was sacked by the Persian Nadir Shah. In 1803 it fell into British hands but was governed by emperors under the custody of the East India Company until 1857 when, during the suppression of the Sepoy Mutiny in Delhi (see SEPOY MUTINY), the last Mogul emperor was taken prisoner. The British recovered Delhi in September 1857 and the city came under the direct rule of the crown when Queen Victoria was proclaimed Empress of India. Delhi was the scene of the great coronation durbars Jan. 1, 1903, and Dec. 12, 1911. At the latter, King George proclaimed the transfer of the capital of India from Calcutta to a new city to be called New Delhi. It was not completed until 1929, however, and was not inaugurated as the official capital until 1931. In 1947 it became the capital of the free Indian state (see INDIA).

DELIAN LEAGUE, a confederacy of Ionian cities founded in 478–477 B.C., primarily as a defensive and offensive alliance against Persia. Eventually the league included more than 200 city-states. Nominal control was vested in an assembly meeting at Delos, in which the states were theoretically equal. The league was permanent and members were to contribute in ships or in money to a central treasury. From the beginning the Athenians were the leaders. In 454 they moved the treasury from Delos to Athens, gradually converting the league into a virtual Athenian empire. The league was dissolved after the Spartan victory over Athens in 404, but a new Athenian confederacy was organized in the fourth century. See ATHENS, *History;* GREECE, History, *The Athenian Empire.*

DELIBES, CLEMENT PHILIBERT LEO, 1836–91, French composer, was born in St. Germain-du-Val. He studied at the Paris Conservatoire, and early in his career as a composer became well known for frothy ballets and operettas, such as *La Source* (1866) and *Coppélia* (1870). He later wrote several operas, but only *Lakmé* (1883), achieved lasting success.

DELICIAS, city, N Mexico, in the state of Chihuahua; 50 miles SE of the city of Chihuahua. It is the market center of the irrigated valley of the Conchos River, where cotton, tobacco, sugar cane, beans, corn, and cattle are raised. Pop. (1950) 18,285.

DELILAH, in the Old Testament (Judges 16:4) a Philistine woman, the mistress of Samson. After learning that the source of Samson's great strength was in his long hair, Delilah had it cut off while he slept, betrayed him to the Philistines, and was rewarded with 1100 pieces of silver from each chief. See SAMSON.

DELINQUENCY, JUVENILE. See JUVENILE DELINQUENCY.

DELIQUESCENCE, the absorption of moisture by a substance exposed to air. All substances exposed to air have a thin layer of condensed moisture on their surfaces. If the substance is readily soluble in water, this layer becomes a saturated solution and continually releases to and receives from the air, molecules of water. If the substance is readily soluble in water, the rate at which the solution receives water vapor from

the air may be greater than the rate at which it releases it, and the volume of solution will increase. After the substance is completely dissolved the process of dilution will continue until the tendency of the solution to absorb water vapor is balanced by its tendency to give off vapor. Deliquescence is a relative property because it depends upon the actual pressure of water vapor in the atmosphere and the temperature of the solution. Since these values vary with time and place, a substance which is deliquescent at one time or in one location may be only hygroscopic at a different time in another location. (See HYGROSCOPIC SUBSTANCE.) The opposite of deliquescence is efflorescence (see EFFLORESCENCE).

Partial deliquescence of table salt in humid seasons is caused by small amounts of magnesium chloride in the salt. The deliquescent property of calcium chloride is put to practical use in various industrial drying operations, in controlling humidity in buildings, and preventing excessive dust on unpaved roads.

PERRY A. BOND

DELIRIUM, a conscious but dreamlike state characterized by bewilderment and disorientation, and sometimes associated with illusions and hallucinations. Usually caused by toxic substances in the body, delirium occasionally develops as a result of mental illness. Causative agents include alcohol, barbiturates, and morphine, infectious diseases such as pneumonia, exhaustion due to malnutrition or surgery, metabolic diseases such as diabetes, injuries such as concussion of the brain, and sunstroke. Treatment involves removal of the cause, control of fever when present, and rest. A patient suffering delirium should never be left alone, since he may injure himself by getting out of bed and wandering about. See DELIRIUM TREMENS.

DELIRIUM TREMENS, delirium characterized by tremors and other symptoms of body poisoning which may follow long and continued use of alcohol. (See DELIRIUM). Although usually associated with chronic alcoholism, delirium tremens can occur in moderate drinkers following consumption of extraordinarily large amounts of alcohol; rarely does it follow sudden abstinence.

Immediately preceding an attack of delirium tremens, the patient is restless and irritable and has insomnia and terrifying dreams. During the attack he is overwhelmed by fear and depression and is disoriented. Tremors develop in the small muscles of the hands, face, and tongue. Hallucinations take the form of small animals, which the patient in his delusion sees crawling over the bedclothes, on the walls, or on his person. See HALLUCINATION.

Treatment consists first of withdrawing the alcohol and correcting the state of malnutrition usually present. Because of his strong suicidal impulses the patient must never be left alone. Psychotherapy, aimed at slowly dispelling the patient's false ideas, is helpful, as are occupational therapy and recreation.

DELIUM, town, ancient Greece in Boeotia, on the S Gulf of Euboea, near the frontier of Attica. A temple of the Delian Apollo stood close by. Near here the Boeotians defeated the Athenians in 424 B.C.

DELIUS, FREDERICK, 1862–1934, English composer, was born in Bradford, Yorkshire. Despite Delius' musical precocity, his father decreed that he abandon music for the family wool business. While in Germany the young man studied music surreptitiously; in 1884 he went to Florida, ostensibly to grow oranges, but spent most of his spare time studying piano under Thomas F. Ward, an organist. After returning to England in 1886 Delius finally received his family's permission to attend the Leipzig Conservatory, but only after the intercession of Edvard Grieg. In 1889 a Leipzig orchestra of 60 men, whose sole payment was a barrel of beer, performed Delius' suite, *Florida*, but his first published work was *Légende* (1892), for violin and orchestra. After living in Paris Delius settled at Grez-sur-Loing, France, where he wrote operas, orchestral variations, rhapsodies, concertos, chamber music, and songs. Although crippled by paralysis after 1922 and totally blind after 1925, Delius continued to compose by dictation. In 1929 he made his last trip to London, where Sir Thomas Beecham conducted six concerts devoted exclusively to Delius' music. Highly individual in feeling, style, and idiom, the work of Delius was slow to gain recognition. But this subtle impressionist was eventually recognized as one of the great composers of his time. Among his works are *A Village Romeo and Juliet* (1901), *Sea Drift* (1903), *A Mass of Life* (1905), *Brigg Fair* (1907), *In a Summer Garden* (1908), *A Song of the Hills* (1911), *On Hearing the First Cuckoo in Spring* (1912), and *Song of Summer* (1930).

DELIUS, NIKOLAUS, 1813–88, German Shakespearian scholar, was born in Bremen. A student and later professor in Bonn, 1855–80, Delius published the first critical edition of Shakespeare's works in Germany, 1854–61. His other works include *Shakespeare-Lexikon* (1851) and *Uber das englische Theaterwesen zu Shakespeares Zeit* (1853).

DELIVERY. See BIRTH; CAESAREAN SECTION; OBSTETRICS.

DELIVERY, in law, is the transfer of possession of a thing from one person to another. However, delivery has various implications as to what it constitutes, what is delivered, and the effect thereof. Delivery may be absolute or conditional. It is absolute when nothing remains to be done to complete the transfer, and is conditional, for example, when the thing is placed in a mutual depositary (escrow), or in the hands of a third person to be delivered by him upon the happening of some contingency. In the field of conveyancing, delivery is the transfer of a deed in such a manner as to deprive the grantor of the right to recall it, should he so desire. Although delivery is considered essential to the transfer of title, anything which clearly indicates the intention of the grantor to surrender control of the deed as evidence of title in the grantee is sufficient, since the question of delivery is one of intention. However, acceptance must take place to complete the delivery. As to the delivery of chattels, it sometimes indicates *transfer* of the property in the chattel and sometimes merely *possession* of the chattel. In this connection the delivery may be *actual* in that a manual transfer is made, or *constructive* in that from the circumstances it is implied that the person in possession is holding it for another as a bailee, or by *operation of law* as when an officer seizes goods under legal process. The assumption of ownership or control of goods by the buyer creates a presumption of delivery. In the law of sales, delivery has been held to be sufficient upon receipt by the buyer of a bill of sale, or written evidence of title, from the seller.

DELKARIA, the Indo-Pakistani subcontinent; the peninsula on which India and Pakistan are located, lying south of the Karakoram and Himalayan ranges.

DELLA PORTA. See PORTA, GIAMBATTISTA DELLA.

DELLA ROBBIA. See ROBBIA.

DELLS OF THE WISCONSIN RIVER, a scenic river gorge, S central Wisconsin, in Sauk and Juneau

The Dells of the Wisconsin River, a Popular Vacation Spot
WISCONSIN CONSERVATION DEPT.

counties; 43 miles NNW of Madison. Here the Wisconsin River has carved a sandstone gorge about 150 feet deep and approximately 10 miles long. Erosion has left many interesting formations. The town of Wisconsin Dells is the starting point for excursion boats and sightseeing trips through the Dells. A Winnebago Indian legend is that the Dells were formed by a giant serpent, moving south, forcing a path through massive rocks.

DELMARVA PENINSULA, E United States, between Chesapeake Bay on the W and the Delaware River, Delaware Bay, and the Atlantic Ocean on the E; including parts of the states of Maryland and Virginia, and most of Delaware. The peninsula extends about 170 miles from Wilmington, Del., on the north to Cape Charles, Va., on the south; it is about 70 miles wide at its broadest point. The Chesapeake and Delaware Canal crosses it in the north.

DELMENHORST, city, NW Germany, in the West German state of Lower Saxony; 9 miles W of Bremen. Delmenhorst is a railroad and industrial center. It manufactures machinery, drugs, linoleum, and cork products and processes food products, wool, and jute. Founded in 1230, the city was originally in the duchy and state of Oldenburg. Pop. (1953) 56,100.

DELMONTE. See San Juan del Monte.

DELOLME, JEAN LOUIS, 1740–1806, Swiss jurist and writer, was born in Geneva, where he practiced law. Forced to leave Switzerland because of the democratic views expressed in his *Examen de trois points des droits*, he lived in England until his return to Switzerland in 1775. Delolme's principal work was *Constitution de l'Angleterre*. A stanch advocate of constitutional government, he also wrote (in English) *Parallel between the English Government and the Former Government of Sweden* (1772), *History of the Flagellants* (1782), and *Essay on the Union of Scotland with England* (1786).

DE LONG, GEORGE WASHINGTON, 1844–81, U.S. naval officer and explorer, was born in New York City. After a voyage to the Arctic in 1873 De Long won the financial support of James Gordon Bennett, a New York publisher, for Arctic exploration. On July 8, 1879, he sailed with 33 officers and men in the *Jeannette*. In September the ship was caught in an ice pack and drifted to the northwest until June 12, 1881, when it was crushed by the ice. Dividing his command into three groups, De Long set out for Siberia, where he and his men died of starvation. His body was recovered in 1882 by a searching party.

DE LONG MOUNTAINS. See Brooks Range.

DELORME or **DE LORME, MARION,** 1611–?50, French courtesan, was born near Champaubert. A woman of great beauty, she was more interested in intrigue than in marriage, and her brilliant salon became a center of Parisian society. After the Marquis de Cinq-Mars was beheaded for plotting to overthrow Armand Jean Cardinal Richelieu, Mlle. Delorme was the reputed mistress successively of the Seigneur de Saint Évremond; George Villiers, first duke of Buckingham; Comte Philibert de Gramont; the Great Condé, and even of Richelieu. During the Fronde insurrection her house was the headquarters of leaders of the plot against Jules Cardinal Mazarin, who issued orders for her imprisonment; she died before the arrest could be effected.

DELORME or **DE L'ORME, PHILIBERT,** 1515?–70, French architect, was born in Lyons. Outstanding among French architects of the Renaissance, he directed work on the palace at Fontainebleau, 1543–59. Previously architect to King Francis I and King Henry II, he was engaged by Catherine de Médicis to direct construction of the Tuileries, 1563, work upon which continued until his death. He wrote the earliest French treatise on architecture. *Nouvelles inventions pour bien bastir et à petits frais* (1561) and built the châteaux of Muette, Saint-Germain, and Saint-Maur, and the gallery at Chenonceaux.

EWING GALLOWAY

Cleopatra's Well, located amid the ruins of a temple and oracle of Apollo, supplies water to the few people still living on the Grecian island of Delos in the Cyclades.

DELOS, modern Dhílos, sacred island of the Cyclades, Greece, in the S Aegean Sea; sometimes called Mikra, or smaller Delos, to distinguish it from the neighboring Rinía, or Megale, the larger Delos. Delos, or Mikra, according to Greek legend, was originally a floating islet that was fixed by Zeus to afford Leto a birthplace for Apollo and Artemis. It was from early times a great religious center, particularly dedicated to Apollo. The festival of Apollo, usually celebrated every five years, brought great crowds to the island. Delos was loosely allied to Athens from the eighth century B.C. and in 478–477 B.C. became the treasury of the Delian League, which was named for it. (See Delian League.) In the fifth and fourth centuries Delos was subject to Athens, but later became independent and a political leader of the Cyclades. It was a great commercial center and slave market, especially after the decline of Rhodes and the destruction of Corinth in 146 B.C. Delos was sacked by Mithridates' army in 88 B.C. and never fully recovered. It was further damaged by pirates at war with Rome in 69 B.C. Excavations have revealed the temple and town, together with a number of inscriptions.

DELPHI, ancient town and shrine, noted for its oracle, in Greece, on the S slope of Mount Parnassus.

The Ruins of Delphi, Great Relic of Greek Civilization

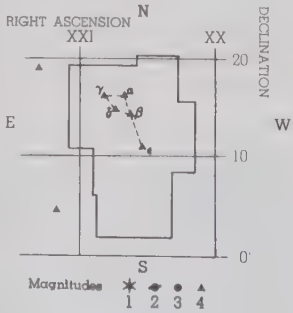
EWING GALLOWAY

Delphi was early regarded as a sacred locality, and there are evidences of worship, probably of the earth goddess, and of Minoan and Mycenaean occupation. With the coming of the Dorians Delphi became a shrine of Apollo. Throughout ancient times the Delphic oracle was one of the most important sources of advice and moral teaching, though the advice was frequently ambiguous or difficult to understand. In some ways, the oracle was a force for unity and peace in Greece. (See ORACLE.) Delphi grew wealthy with the proceeds of gifts to the oracle and trophies representing gratitude. The sacred way, which led to the temple, had treasuries of such memorials on both sides. There was a stadium in which the Pythian games were held every four years. See PYTHIA.

Delphi was involved in a series of sacred wars. The first was waged early in the sixth century B.C. against the citizens of Cirrha, who levied toll on pilgrims to the shrine. The war resulted in the destruction of Cirrha. A second war about 448 between the Phocians and Delphi, brought in Sparta on the side of Delphi and Athens on that of the Phocians. Delphi was restored to power and reaffirmed in its position by the Peace of Nicias, 421. In the fourth century B.C., renewed sacred wars, occasioned by another Phocian seizure in 357, gave Philip of Macedon an opportunity to intervene successfully in 346 and again in 339–338, when the war ended in Macedonian dominance over Greece. Delphi was threatened by a Gallic invasion in 279, and plundered by Sulla in 86 B.C. Nero is said to have carried off 500 statues from the treasuries. Julian attempted to revive the shrine without success, and it was closed by Theodosius I in 390. The site of Delphi has been extensively excavated by archaeologists, and there is a noted museum of art and archaeology, opened in 1903. See also AMPHICTYONIC COUNCIL; GREECE, History.

DELPHINIUM, or larkspur, a genus of hardy annual and perennial popular garden plants belonging to the buttercup family, *Ranunculaceae*. More than 300 species and varieties are distributed throughout the North Temperate Zone. The leaves of most species are finely divided. In the common blue varieties the long-spurred flowers are crowded on upshooting racemes or panicles; other varieties are pink, yellow, or red in color. Some species reach 6 feet in height and make magnificent garden flowers. The plants grow best in deep, rich, sandy loam and require an abundance of water. The simplest method of propagation is by root division or cutting. Delphiniums are easily grown from seeds sown indoors early in the spring. Among the blue-flowering American species are *Delphinium exaltatum*, *D. cashmerianum*, and *D. formosum*. A California annual, *D. cardinale*, has scarlet flowers and *D. zalil* has yellow flowers.

DELPHINUS is a small constellation of stars, known also as Dolphin, located northeast of the constellation Aquila. (See CONSTELLATION.) It is on the meridian about 9 P.M. EST, in mid-September at a northern latitude of about 40°. Four of its stars form the little diamond-shaped group known as Job's Coffin. The group α Delphini, β Delphini, and γ Delphini are fourth magnitude binary stars (see DOUBLE STARS). The tail of the Dolphin is ϵ Delphini.



Constellation Delphinus

DELPHOS, city, W Ohio, in Allen and Van Wert counties, on the Akron, Canton, and Youngstown, the Nickel Plate, and the Pennsylvania railroads and U.S. Highway 30; 14 miles NW of Lima. Situated in a wheat, corn, and poultry farming region, Delphos has a truck assembly plant, and manufactures furniture, metal and wood products, and sporting goods. Pop. (1950) 6220.

DELRAY BEACH, city, SE Florida, in Palm Beach County, on the Atlantic Ocean, the Florida East Coast and the Seaboard Air Line railroads, and U.S. Highway 1; 17 miles S of Palm Beach. Well known as a summer and winter ocean resort, it has a fine beach and numerous recreational facilities. The surrounding farming region produces winter vegetables and commercial flowers, especially gladioli. Pop. (1950) 6312.

DEL RIO, city SW Texas, county seat of Val Verde County, on the Rio Grande, the Southern Pacific Railroad, and U.S. highways 90, 277, and 377; 145 miles W of San Antonio, across the river from and connected to Villa Acuña, Mexico, by an international bridge. Del Rio is an important shipping center for wool and mohair from sheep and goats raised in the surrounding hills, and for grapes, fruit, truck crops, and alfalfa grown in irrigated valley lands. Industries include wineries and the manufacture of ornamental leather products and clothing. The San Felipe springs, near the city, have been used for irrigation since 1868. Pop. (1950) 14,211.

DELTA, city, W central Colorado, county seat of Delta County, on the Gunnison River, the Denver and Rio Grande Western Railroad, and U.S. Highway 50; 35 miles SE of Grand Junction. Delta is a trading center for an irrigated farming region producing sugar beets, beans, fruit, and dairy products. Pop. (1950) 4097.

DELTA, a generally fan-shaped deposit of mud, silt, sand, or gravel at the mouth of a river. Deposition of such alluvial material is caused by the reduction in the river's velocity and consequent reduced ability to transport material as it enters calm water. In order for a delta to be built river deposition at the river mouth must occur more rapidly than the material can be carried away by ocean currents. Delta growth is often fairly rapid, ranging from several feet a year for the Nile River delta to about 200 feet a year at the Mississippi River delta. The roughly triangular alluvial tract at the mouth of the Nile, whose resemblance to the Greek letter delta gave rise to the term, is a characteristic delta form (see NILE RIVER). Such deltas are crossed by numerous divergent channels, known as distributaries, of the main river. Deltas may have an elongated or bird's foot shape, as in the case of the Mississippi River delta (see MISSISSIPPI RIVER). Besides being formed on sea coasts, deltas may be built where a river enters a lake or at the confluence of two rivers. Deltas of large rivers often provide extensive level areas of fertile land that support dense agricultural populations. Notable deltas of the world include those of the Nile, Niger, Indus, Ganges-Brahmaputra, Irrawaddy, Yangtze, Hwang Ho (Yellow), Lena, Rhine, Rhône, Po, Mackenzie, Yukon, Colorado, Mississippi, Orinoco, and Amazon rivers.

DELTA AMACURO, territory, NE Venezuela, bounded by the Atlantic Ocean on the N and E, British Guiana on the SE, and the states of Bolívar on the S and SW and Monagas on the W and NW; area 15,521 sq. mi.; pop. (1950) 33,648. Tucupita is the capital. The northern and central sections of the territory consist mainly of the swampy lowlands of the Orinoco River delta, where extensive flooding occurs. The south is also largely lowland but includes the low highlands of the Sierra Imataca in the interior. The climate is hot and humid throughout the year; tropical rain forest covers most of the territory and the coasts are fringed with mangroves. The sparse population of the area includes a considerable proportion of primitive Indians. Crops cultivated include rice, corn, sugar cane, bananas, cacao, coconuts, and tobacco. Fishing is an important industry. Lumber, gums, divi-divi, and barks are the main

ART INST. OF CHICAGO

The Flood, One of Michelangelo's Genesis Paintings

forest products. Among the minerals known to occur are petroleum, asphalt, bauxite, and iron ore.

DELTA STATE COLLEGE. See COLLEGES AND UNIVERSITIES.

DELUC, JEAN ANDRE, 1727–1817, Swiss geologist and meteorologist, was born in Geneva. In 1773 he went to England, where he was reader to Queen Charlotte, the consort of King George III. Attempting to reconcile science with the account of creation in Genesis, he wrote *Lettres physiques et morales sur les montagnes et sur l'histoire de la terre* (1778). In this work he interpreted the biblical six days as six geological epochs. Deluc invented a hygrometer and developed the dry pile or electric column. He also published the first correct rules for determining the heights of mountains from barometric readings. Among his works were *Recherches sur les modifications de l'atmosphère* (1772) and *Traité élémentaire de géologie* (1809).

DELUGE, THE, a flood which, according to the biblical story (Gen. 6–9), overwhelmed the earth and destroyed all human life except Noah and his family. God proposed to destroy man because of his sin; at God's command Noah built an ark into which he took his family and a pair of every living creature; "the fountains of the great deep burst forth" and "the flood continued forty days upon the earth." The ark came to rest "upon the mountain of Ararat"; after the "waters returned from off the earth" Noah built an altar to offer sacrifices and God set the rainbow in the cloud as a covenant that He would never again send a flood to destroy the earth. This narrative is described by some scholars as a composite of two sources: the Yahwistic document or J (900–750 B.C.) and the priestly code or P (fifth century B.C.), two accounts which differ somewhat in detail and in theology.

Deluge legends occur in the folklore and in the early literature of other peoples. Ancient Babylonia had two stories, the longer one being the Gilgamesh epic (traced to about 2000 B.C.), the story of Ut-Napishtim, a favorite of the gods who was saved from a disastrous flood. The epic has many parallels with the Genesis story: both have moral and religious objectives; in both man's sin is the cause of the disaster; both end with a sacrifice and a covenant. One great difference is the polytheism of the Babylonian epic and the monotheism of the Hebrew story. Some scholars believe that since the Babylonian story is the older the biblical account is based on it; others believe that both were derived from a common Semitic source. Archaeological excavations in Babylonia have uncovered evidence of disastrous floods in several places. See BABYLONIA.

Deluge stories are also found in India, Persia, Syria, and Greece, and among such widely scattered peoples as the American Indians and the Polynesians in the South Pacific.

DELUSION, a false belief or conviction which cannot be changed by reason or by the evidence presented by the person's own senses. Delusions are attempts of the individual to solve his particular life problems and are based in part on reality and logic. They are a symptom of severe mental disorders such as paranoia and schizophrenia. See PARANOIA; SCHIZOPHRENIA.

Delusions are of three types: delusions of grandeur, delusions of reference, and delusions of negation. Persons suffering delusions of grandeur believe themselves to be great, wealthy, and powerful, and often assume the character of some famous individual in history. Delusions of reference concern the person in relation to others. In this type the individual interprets casual remarks as having significance, usually implying insult to him. In delusions of negation, the person denies the existence of conditions and objects around him. Treatment is aimed at the underlying mental illness with which the delusions are associated and include shock therapy and psychotherapy. See PSYCHOTHERAPY.

DEMAIN. See DEMESNE.

DEMAK, town, Indonesia, central Java; 15 miles ENE of Semarang. Demak is an agricultural trading center for rice, corn, cassava, and sugar. It contains a mosque, originally built in 1468. In the fifteenth century the town was the capital of the Moslem kingdom of Demak. Pop. about 10,000.

DEMAND AND SUPPLY. See SUPPLY AND DEMAND.

DEMAND DEPOSIT. See DEPOSIT.

DEMANOVA CAVES, underground labyrinth, E Czechoslovakia, in Slovakia, about 4 miles S of Liptovský Svätý Mikuláš, containing stalactites, stalagmites, columns, and underground rivers and lakes. About 6 miles of the caves are open to visitors.

DEMAVEND, MOUNT, extinct volcano, highest peak, 18,934 feet, in the Elburz Mountains of Iran, about 45 miles NE of Teheran.

DEMBEA, LAKE. See TANA, LAKE.

DEMENTIA. See MENTAL DISORDER.

DEMENTIA PRAECOX. See SCHIZOPHRENIA.

DEMERARA, county, central and N British Guiana, bounded by the Atlantic Ocean on the N, and the counties of Berbice on the E and SE and Essequibo on the SW and W; area 4420 sq. mi.; pop. (1950 est.) 250,000. Demerara, the smallest of the three counties that comprise British Guiana, is economically the most important. The county consists largely of densely forested lowlands but has some highlands in the south. It is drained principally by the Demerara River. The climate is generally hot and humid. Most of the population is concentrated near the coast and along the lower Demerara River. Leading crops are sugar cane, rice, fruits, and vegetables. The extensive forests of the region yield tropical hardwoods and other forest products. Large-scale bauxite mining is conducted near Mackenzie; other mineral resources include gold, kaolin, and diamonds. Georgetown is the capital of the county and also of British Guiana. Other major urban centers are Vreeden-Hoop, Buxton, Mahaica, Mahaicony, and Mackenzie.

DEMERARA RIVER, NE South America, in central and N British Guiana, rises in the highlands in the S part of the county of Demerara, and flows N to the Atlantic Ocean at Georgetown. The Demerara River has a total length of nearly 200 miles and is economically the principal river of the colony. The stream flows through dense forests that yield tropical hardwoods; alluvial gold occurs in the upper reaches of the river. The Demerara is navigable for ocean shipping as far as Mackenzie, the center for bauxite exportation, and smaller vessels can reach Malali, more than 100 miles above Georgetown.

DEMEROL. See MEPERIDINE.

DEMESNE or **DEMAIN,** under the feudal system, actual dominion over land as opposed to the theoretical dominion of the king or overlord. Thus demesne lands were lands not let out in tenancy but reserved by the crown or lord for use and occupancy. In a more restricted sense demesne is that portion of an estate comprising the land around the mansion, the park, or chase. See MANORIAL SYSTEM.

Ancient demesne signifies lands vested in the king at the time of the Norman Conquest, though perhaps subsequently granted to tenants; it was also the form of tenure by which these lands were held. See TENURE.

DEMETER, in Greek mythology, goddess of agriculture, known as the earth-mother. The daughter of Cronus and Rhea, she was the sister of Zeus, by whom she became the mother of Persephone, through whom she was connected with the lower world. Both Demeter and Persephone were worshiped as the grain spirit at the Thesmophoria (a women's autumn festival), and were the principal characters in the Eleusinian mysteries, about which little is known. The Romans identified Demeter with Ceres (goddess of the harvest growth), who was honored with Tellus (the earth), both after seed time and just before the harvest. The Cerealia was the principal festival of Demeter in Rome.

DEMETRIUS, either of two Macedonian kings. Demetrius I, Poliorcetes (the Besieger), 337–283 B.C., ruled after his father, Antigonus Cyclops, was killed in battle during a long war with Cassander, Seleucus, and Pyrrhus. After a reign of six years Demetrius was ousted by Pyrrhus and, in an abortive attempt to regain his throne, was taken prisoner by Seleucus. He died in captivity. His grandson, Demetrius II, 278?–229 B.C., ruled for 10 years, during which time he was constantly plagued by threats of invasion. He died after a battle with the Dardanians.

DEMETRIUS, any one of three Syrian kings. Demetrius I, surnamed Soter (the Savior), died 150 B.C., acquired his surname when he delivered the Babylonians from the tyranny of the satrap Timarchus, 160 B.C. He also figures in Jewish history because of his battles with the Maccabees. His son, Demetrius II (surnamed Nicator) died ?125 B.C., regained the Syrian throne from the usurper Balas with the help of Ptolemy VII of Egypt. Detested for his vicious cruelty, he was killed, possibly at the instigation of his wife (Ptolemy's daughter) during a civil war. His grandson, Demetrius III, (surnamed Eukairos and Philometer) died ?88 B.C., established his court at Damascus, but after a relatively short reign was defeated and taken prisoner by Mithridates of Parthia.

DEMETRIUS or **DIMITRI,** the False, the name of several pretenders to the Russian throne between the years 1603 and 1613. See RUSSIA, History.

DE MÉZIÉRES Y CLUGNY, ATHANASE, 1715?–79, French explorer, was born in Paris, went to Louisiana, ?1733, and became a soldier, trader, and planter. When Louisiana was ceded to Spain, 1762, he entered the service of Spain and won the allegiance of the hostile Indians of the Red River Valley. His diaries and reports of visits to distant tribes provided the first definite information of northern Texas. Appointed governor of Texas, 1779, De Mézières died before taking office.

DE MILLE, CECIL BLOUNT, 1881– , U.S. motion picture producer and director noted for "spectacle," was born in Ashfield, Mass. In 1918 he organized the Mercury Aviation Company, said to have been the first to carry passengers on regular flights. Identified with motion pictures after 1913, De Mille's productions included *The Ten Commandments*, *The King of Kings*, *The Plainsman*, *Samson and Delilah*, and *The Greatest Show on Earth.*

DE MILLE, JAMES, 1837?–80, Canadian author, was born in Saint John, N.B. He wrote *The Martyr of the Catacombs* (1858), *The Cryptogram* (1871), and *A Strange Manuscript Found in a Copper Cylinder* (1888). De Mille also wrote humorous books for boys, including *Andy O'Hara* (1860) and *The Dodge Club* (1869).

DEMING, village, S central New Mexico, county seat of Luna County, on the Santa Fe and the Southern Pacific railroads and U.S. highways 70, 80, and 260; 80 miles NW of El Paso, Tex. Situated in an irrigated farming area, Deming is a market center for corn, fruit, cotton, pinto beans, livestock, and poultry. Nearby are copper, zinc, and fluorspar deposits. Pop. (1950) 5672.

DEMISE, the transfer of an estate by will or lease for a term of years, or, less often, for life. When used in a lease at common law demise implied a covenant for quiet enjoyment, and no other word had this effect.

This is still proper terminology in many jurisdictions, especially in those states where the common law largely prevails, but in many states any other word of similar import does as well, as, for example, let or lease. In English law demise also denotes the transmission or passing of all sovereign rights and properties to the successor of a sovereign, as a matter of law, upon the latter's death or abdication. It is spoken of as "the demise of the crown." See CROWN.

DEMIURGE. In Plato's greatest work, the *Timaeus*, the Demiurge is the creator of the universe, who stands midway between a Supreme Intelligence as pure "Ideas" and chaotic matter (*hyle*), and in combining them creates the actual world. Among Gnostics the Demiurge was vaguely identified with Jehovah, (Yahweh or Jahve) of the Old Testament but not as a Supreme Being and therefore not one with the Christ as aspects of the Trinity. The Demiurge as Jehovah could not reveal the higher truth to man; Christ, on the other hand, was considered by most of the Gnostics to be the bearer of the higher truth. In this light the Gnostic heresy is fundamentally that of separating Jehovah (God the Father) from Christ (God the Son). See GNOSTICISM.

DEMMIN, town, NE Germany, in the East German district of Neubrandenburg, at the confluence of the Tollense and the Peene rivers; 28 miles S of Stralsund. Demmin is an industrial and agricultural center. Industries include beet sugar refining, brewing, and distilling; there are manufactures of machinery, barrels, and twine. Before 1953 Demmin was in the state of Mecklenburg, and prior to 1945 in the

CHICAGO HIST. SOC.

Caleb Bingham's *County Election* depicts 1860 election scene, before days of secret ballot.

former Prussian province of Pomerania. Pop. about 20,000.

DEMOCRACY, a form of government derived originally from the political experience of ancient Greece and named from the Greek words *demos* (the people) and *kratos* (rule). Basic to democracy is the notion of restraint upon government; the powers of government are specifically circumscribed by means of a single written constitution or a series of organic laws. See Constitution.

Democratic forms of government rule by majority whether in elections or in the actions of representative legislative bodies, although a plurality does occasionally determine the outcome of an electoral contest in which more than two parties are involved. Elections must be held at fixed intervals as provided by law; the ballot must be general, direct, secret, and equal with at least two major political parties participating; suffrage must be granted to all citizens of an appropriate age irrespective of sex, race, and religion, and the educational qualifications should not exceed those required for citizenship. However, certain persons such as aliens, the insane, and certain convicted felons are deprived of the franchise. See Election.

The democratic doctrine of majority rule has its corollary in the recognition of minority rights and in the moral concept of the inherent dignity and worth of the individual. The basic democratic civil liberties guarantee freedom of speech and of the press—subject to such limitations as are imposed by the law upon slander, patent obscenity, libel, and sedition—freedom of assembly—again subject to limitations if it should lead to public disorder; and freedom of conscience, which guarantees the right to worship according to one's choice, providing for the separation of church and state and prohibiting a specific religious test as a qualification for holding public office. See Civil Liberties and Rights.

Attributes of Democracy

Democracy is a form of government in which the military is subordinate to civil authority. It rejects arbitrariness and is based upon the principles of due process and the rule of law. No person may be detained by authorities without cause for the detention being shown before a court of law (the writ of habeas corpus, of English origin); no person may be compelled to testify against himself; and all persons must be presumed innocent until found guilty beyond a reasonable doubt. Every accused person in a democracy has the right to legal counsel and to confront his accusers in a public trial. One of the fundamental principles of democracy is that of the inviolability of the person and of the home and its contents against searches and seizures except upon the issuance of a warrant by a judicial authority who is independent of the executive and prosecuting agencies of the government. Every resident has the right of free travel within a democratic country without any kind of passport. Property can be taken by the government only after judicial procedure and payment of just compensation. In the words of the Fifth and Fourteenth Amendments to the Constitution of the United States, no person may be deprived of "life, liberty, or property, without due process of law."

Equality of Opportunity. Democracy is based upon the proposition, stated in the first words of the American Declaration of Independence, that "all men are created equal." The result of this belief is that democracy is irreconcilable with all forms of special privilege and aristocracy based upon birth or even upon wealth, military rank, or intellect. While the equality of men obviously does not mean that men are necessarily equal in ability, in earning power, or merit, it does mean that they shall enjoy equality of opportunity and have the same rights. See also Declaration of Independence.

Greek Contribution to Democracy

The ancient Greeks, especially the Athenians, are often regarded as the founders of the democratic tradition, and there are many features of their political system—though by no means, all—which support this view. Final authority in the Athenian *polis* or city-

DEMOCRACY

PENNSYLVANIA R.R. CO.

Shrine of American liberty is Independence Hall, home of the Liberty Bell and site of the signing of the Declaration of Independence on July 4, 1776.

WIDE WORLD

The nation's beautiful Capitol Building, with its majestic dome and House and Senate wings, is the scene for the commemoration of a historical event.

A feature of U.S. government is the president's annual State of the Union message to Congress, reviewing accomplishments and revealing future aims.

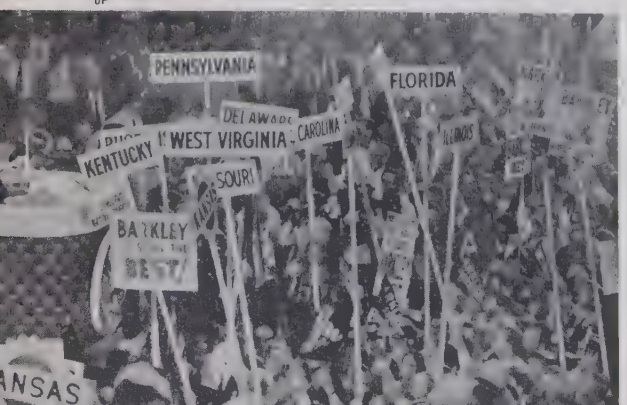
UP

Under the American form of government, candidates for the nation's two top positions, president and vice-president, are selected in open convention by the state delegations.

UP

UP

An American senator, Margaret Chase Smith, casts her vote in a State of Maine election to determine which party's candidate shall represent the state.



CHICAGO TRIBUNE

The government of a great city is conducted democratically by the mayor and common council.

Local school boards conduct classes where new immigrants desirous of becoming U.S. citizens can obtain necessary instruction.
CHICAGO BOARD OF ED.

A policeman explains to students, left, how a police department operates, helping them to learn the duties of a citizen.
WIDE WORLD

Below, an inherent advantage of the democratic form of government is the privilege every citizen has of choosing government officials by secret ballot in free elections.
OLIVER JENKINS

Aims and methods of improving education are the subject of this discussion group at a White House conference on education, with parent representatives from many states.
WIDE WORLD

state resided in the assembly, a large body composed of all male citizens, including artisans and farmers, which met regularly to debate public issues in the agora or central public square. A smaller body, the Council of Five Hundred, performed executive functions and was elected by lot. The judicial function was also uniquely democratic since elected juries of several hundred rendered judgments independent of a constituted judge; these jury-courts had the additional function of controlling the magistrates and holding them accountable for their acts. Limited terms and the principle of rotation in office led to wide participation in public affairs and served to check the growth of personal power. See ATHENS, *History;* GREECE, HISTORY.

THE ENGLISH CONTRIBUTION

The rise of democracy in England occurred after clashes between royal prerogative and the rights of parliament. Establishment of the supremacy of the latter, or, more specifically after 1911, the supremacy of the House of Commons, was the result. Originally the effort to limit royal authority began with the barons who compelled King John to sign the Magna Charta (1215). (See MAGNA CHARTA.) This was merely a promise exacted from the king that he would not exceed his powers. Although the rights protected were those of the barons, the charter constituted an important precedent because it implied the right of the nobles to depose the monarch if he usurped powers which belonged to them. In 1628 the Petition of Right was presented to King Charles I by both houses of parliament, and in accepting it he agreed that taxes could not be levied without the consent of parliament; that no freeman could be imprisoned without due process of law; that troops might not be quartered in private homes; and that martial law would cease.

The Interregnum. The struggle between king and parliament assumed its most extreme form in the execution of King Charles I in 1649, but the triumph of parliament was soon nullified by the proclamation of Oliver Cromwell as Lord Protector of the Commonwealth. Among the most prominent spokesmen for democracy during this period was John Lilburne (1614–57), leader of the Levellers, who was arrested by Cromwell. The Levellers advocated popular sovereignty, biennial parliaments, universal manhood suffrage without a property qualification, freedom of religion, equality of all before the law, no imprisonment for debt, and the rights of the accused to refuse to testify against himself and to have his case decided within six months. Although the Levellers were unsuccessful in gaining immediate acceptance of their program, their writings must be regarded as an important landmark in the development of democracy. The poet John Milton (1608–74), although he did not believe in representative government, made his contribution to democratic thought by arguing against tyranny and advocating freedom of expression in his *Areopagitica* (1644).

The Restoration. The failure of Cromwell's "constitutional dictatorship" and the restoration of the monarchy in 1660 prepared the ground for the continued struggle between king and parliament. With the supplanting of the Stuarts by William and Mary of Orange in 1689, the supremacy of parliament was established by the Declaration of Right, to which the new monarch, King William III, acceded. It abolished the "pretended power" of suspending laws by royal authority without the consent of parliament; made it impossible for taxes to be levied or for a standing army to be raised in time of peace without parliament's consent; and provided for guarantees against "excessive bail . . . (and) cruel and unusual punishments" (a phrasing later employed in the American Bill of Rights) as well as for complete freedom of debate in parliament. See ENGLAND.

John Locke. The principal theoretician and apologist for the Glorious Revolution of 1688–89 was John Locke (1632–1704), who in his second treatise *Of Civil Government* (1689) reasoned that government arose as a result of a limited social contract by which power was not delegated to one sovereign but to the whole community. Government, Locke argued, was based upon popular consent, and the majority could forcibly resist civil authority if that authority had violated the contract and natural rights. Locke's influence as a theorist of constitutional government can hardly be overestimated since his theory of revolt underlay the American Declaration of Independence and his writings were read by the American founding fathers. See LOCKE, JOHN.

Suffrage Reform. Establishment of the supremacy of parliament in seventeenth century England did not necessarily represent the triumph of democracy, for parliament had yet to become a fully representative body. This requisite of democracy was not accomplished until the suffrage was extended in the nineteenth and twentieth centuries. The Reform Bill of 1832 substantially reduced property qualifications for voting, substituting "occupation" of property fixed at an annual valuation of £10 for the previous requirement of ownership of such property. Thus the franchise was extended to include the middle class, but it was not until 1867 that nearly 1 million factory workers received the right to vote. By 1884 universal manhood suffrage was close to attainment. (See REFORM BILLS.) The special university constituencies and plural voting were abolished in 1948; these had entitled graduates of certain universities or persons having business premises in a constituency other than that of their residence to a maximum of two votes (which could not, however, be cast in the same constituency).

Other landmarks in the development of British democracy were the Catholic Emancipation Act of 1829 (see CATHOLIC EMANCIPATION) and the act of 1833 which abolished slavery within the empire. By the first the discriminatory restrictions imposed upon Catholics were removed, giving them equal status with non-Anglican Protestants and permitting them to sit in parliament.

Bentham, Mill, and Green. Among the leading advocates of reform was Jeremy Bentham (1748–1832), who, in his voluminous writings, called for annual parliaments (to keep legislators in close contact with the electorate), vote by ballot in order to prevent intimidation, the equalization of election districts, and the abolition of the House of Lords and the monarchy. Bentham was also the father of a more humane penology.

John Stuart Mill (1806–73), who continued the utilitarian school of thought developed by Bentham, went further and advocated women's rights in university education, in suffrage, and in holding public office. His essay *On Liberty* (1859) is an important statement on behalf of freedom of thought.

A different orientation was given to nineteenth century liberalism by Thomas Hill Green (1836–82), who taught that the concepts of individual freedom and the absence of restraint are not enough and that society has certain obligations to create conditions which will make individual freedom and responsibility not only possible but more meaningful. This view saw the necessity of the state's assuming responsibility for adopting policies to secure for all a minimum standard of living and a basic degree of economic security and education for the intended purpose of promoting the moral growth of the citizenry. From this new position in the development of English political thought it was not a long step to the denial of laissez-faire economics.

THE AMERICAN CONTRIBUTION

The American decision to adopt a constitution, a single document expressing the fundamental principles upon which the United States government is based, was in itself an epoch-making step since the British did not and do not have a single constitution

but rather a series of fundamental laws. However, the American debt to European political thought, and especially to that of England, is evident. John Locke's political theory is reflected in the Declaration of Independence, and Jefferson along with James Otis and John Adams had read James Harrington (1611–77), who had contributed to the ferment in political thought during the Cromwellian period in England. Harrington's *Oceana* (1656) described an ideal republic in which the principle of checks and balances was applied by means of a written constitution; the popular government thus created was to be based on a separation of functions (similar to the American separation of powers) and on the principle of rotation in office, permitting in this way a maximum number of individuals to participate in government to prevent stagnation. The American founding fathers also owed a debt to the Frenchman Baron de Montesquieu (1689–1755), whose idealized study of English government in his *L'Esprit des lois* (1748) stressed the value of balance and the separation of the legislative, executive, and judicial powers. Montesquieu incorrectly attributed liberty in England to the separation of powers which was not, in fact, present in English government. However, this error did not preclude his influence upon the authors of the American Constitution to whom preventing the abuse of governmental power was important.

The Federalist Papers. The theoretical arguments underlying the American Constitution were stated in great detail in *The Federalist* (1787–88), papers written by Alexander Hamilton, John Jay, and James Madison. The Federalist papers are an important contribution to the history of political thought although they were written for the purpose of obtaining the ratification of the Constitution. In addition to the notion of a single written constitution embodying the principle of the separation of powers as a guarantee against tyranny, Americans developed the first genuine effective federal union in accordance with the principle of balance; the states were to provide a guarantee against the "encroaching spirit of power," as Madison termed it (*The Federalist*, No. 48). See FEDERALIST PAPERS.

Judicial Review. Still another unique American contribution to democracy is the doctrine of judicial review which was developed by the Federalist-appointed Chief Justice John Marshall in the case of *Marbury* v. *Madison* in 1803. This doctrine granted the Supreme Court the power to declare acts of Congress unconstitutional. Such power does not exist in most other democratic governments—in England the parliament is unquestionably supreme—but it has become an important aspect of American democracy and provides an additional guarantee against abuse of authority. See CONSTITUTION OF THE UNITED STATES.

Bill of Rights. Still another distinction dignifies American democracy. It was the first to incorporate a specific Bill of Rights into its Constitution. While the founding fathers did not see fit to include a Bill of Rights in their final draft of the Constitution, it was added to that document in the form of the first ten amendments, in order to obtain ratification by some of the states.

Thomas Jefferson. Probably the greatest democratic political theorist America has produced was Thomas Jefferson (1743–1826), author of the Declaration of Independence. Nominally an aristocrat, Jefferson believed, however, in the rationality and equality of all men and in the proposition that government be based upon popular consent. Believing that no generation should bind succeeding generations, he suggested that the question of effecting changes in the government be considered every 19 years. As a believer in individualism, Jefferson had a profound attachment to rural society, which he believed to be more conducive to democracy, and was an advocate of decentralized economic power and small banks as opposed to the Bank of the United States which Hamilton favored. See JEFFERSON, THOMAS.

Lincoln and Others. The fact that the American Constitution has proved to be an enduring instrument of government can be attributed in no small part to the fact that able men have usually held high public office in times of crisis. There has also been present a unique amalgam of patience, caution, and fortitude which has characterized much of American public life. Lincoln expressed it in his First Inaugural Address in 1861 when he observed that the American people "have wisely given their public servants but little power for mischief, and have, with equal wisdom, provided for the return of that little to their own hands at very short intervals." Although Lincoln was the only president ever to suspend the writ of habeas corpus (in 1861, during the Civil War), he undoubtedly discounted the danger of this measure by recalling his earlier statement: "While the people retain their virtue and vigilance, no administration, by any extreme of wickedness or folly, can very seriously injure the government in the short space of four years."

The Practice of Democracy in the United States. Until the administration of Woodrow Wilson, 1913–21, "democracy" was not a word usually encountered in American public life in reference to the form of government in the United States. The founding fathers did not view themselves as establishing a democracy; for example, the Constitution contains no reference to democracy as a form of government and provides that: "The United States shall guarantee to every state in this Union a Republican Form of Government." Madison (in *The Federalist*, No. 10) defined pure democracy as "a society, consisting of a small number of citizens, who assemble and administer the government in person" and he viewed such a form of government as encouraging "turbulence and contention" and as being "incompatible with personal security, or the rights of property." Representative government, for the authors of the Constitution, meant a republic since the word democracy evoked an image of the classic (Athenian) assembly of citizens debating public affairs in the agora.

Among the nondemocratic features of the United States and the original Constitution were the indirect election of the president through the Electoral College, the election of United States senators by state legislatures (replaced by popular election in 1913), the continued existence of slavery until 1863–65, and the existence of a restricted suffrage based upon property and other qualifications stipulated in state and not in federal legislation. Such provisions as those prohibiting bills of attainder (punishment by legislative act without a judicial trial) and ex post facto laws (laws applied retroactively to acts which were not criminal at the time they were committed) as well as the appended Bill of Rights were important democratic features. In addition, the founding fathers wisely confined themselves to fundamentals which allowed for change and permitted the strengthening of the democratic features of the Constitution instead of attempting to foresee all contingencies and provide for them in specific clauses of the Constitution. The amending process was not made too difficult and where it has not succeeded in promoting democracy the Supreme Court has often assumed the responsibility for doing so in deciding specific cases brought before it. Basic to American democracy is the principle that we have "a government of laws, and not of men" (Massachusetts Constitution of 1780), which means that no man may consider himself to be above the law.

Separation of Powers. American democracy has rested heavily upon the separation of powers principle by which power is distributed among the three separate but co-ordinate branches of government. However, the three branches are not completely sep-

arate. The president exercises a legislative function in proposing specific laws and in employing his veto power, and the executive branch often exercises delegated legislative authority in administering acts of Congress. The Supreme Court also legislates when it declares federal and state laws unconstitutional and invalid. The vice-president, a member of the executive branch, presides over the Senate, part of the legislative branch. The president influences the judiciary indirectly by his power of appointing federal judges and the Senate does the same through its power of confirmation of such appointments. Congress has created all federal courts except the Supreme Court but it does determine the number of justices who sit on the nation's highest tribunal. The Senate is empowered to perform a judicial function when it tries federal judges and officers impeached by the House of Representatives. The executive branch houses quasi-judicial, independent, regulatory commissions such as the Interstate Commerce Commission, the Federal Trade Commission, the Federal Communications Commission, and others. All of the executive departments were created by Congress and exist at its pleasure. Thus a situation prevails which has at times led to considerable rivalry and friction among the three branches. Under the principle of staggered terms of office (four years for the president, two for representatives, and six for senators) it is possible, and at certain times very likely, for the executive branch to be controlled by one party and the legislative branch by the other with deadlocks and mutual recrimination resulting, especially in election years. See SEPARATION OF POWERS.

Dual System. As a result of profound social and economic changes, the role of the federal government and the division of powers between it and the states have been altered somewhat. Generally this has been in the direction of additional powers accruing to the federal government. Two world wars and a serious economic depression led to vastly increased federal taxing power, with personal income and corporate profit taxes playing a large role, while the states continued to rely on property and sales taxes and so encountered difficulties in finding new sources of revenue. The states have also come to rely upon the federal government to an increasing extent for financial grants-in-aid for highways, schools, housing, and other pressing needs. The powers of the federal government have also been increased by the Supreme Court's broad interpretation of the clause in the Constitution granting Congress the power "to regulate Commerce . . . among the several States." This clause, as interpreted by the Supreme Court, grants Congress the authority to regulate wages and hours of workers who are only remotely engaged in interstate commerce. In addition, antitrust legislation, the Pure Food and Drug Act, the Federal Trade Commission Act, and many other acts of regulatory and social legislation are notable examples of this extension of federal power. Despite the growth of federal power, the states continue as real and meaningful units of government and have, in the aggregate, the last word because of their vital role in the process of amending the Constitution. See also FEDERAL STATE.

Civil Liberties. Civil liberties constitute one of the most debated democratic perquisites affected by governmental activity. Since the decisions of the Supreme Court derive from specific cases which have been heard at various times and under varying conditions, the line between liberty and authority has not always been well defined. For example, in the area of religious freedom, the court ruled in 1943 that a child enrolled in a public school cannot be compelled to salute the flag if the act interferes with the religious convictions of the child or, in reality, those of the parents; the court thus reversed an exactly opposite decision rendered three years earlier in a very similar case in which it had ruled that the flag salute was compulsory. Freedom of speech and assembly have created the most difficult problems. Justice Holmes developed the "clear and present danger" test, for the purpose of distinguishing between permissible and impermissible utterances, in the case of *Schenck* v. *United States* in 1919; those utterances that do not constitute a manifest danger are permissible, although the Justice recognized that it was "a question of proximity and degree" and that there cannot be as much freedom in wartime as in time of peace. Application of the "clear and present danger" test has not been uniform, but in the opinion in *Dennis et al.* v. *United States* in 1951 the court held that "speech is not an absolute, above and beyond the control of the Legislature" and that in each particular case of alleged advocacy of overthrow of the government "the issue (of the applicability of the test) is properly one for the judge to decide." Thus the courts continue to have the final word. However, in wartime circumstances the first word is often more effective and decisive than the last. For example, in 1944 the court upheld the constitutionality of the unprecedented military order which led to the forcible evacuation of more than 70,000 American citizens of Japanese descent, as well as thousands of Japanese aliens, from the Pacific Coast in 1942; this decision was based on the grounds that the evacuation was a necessary war measure and that the federal government was not forbidden by the Fifth Amendment from denying equal protection of the law. Thus no court appears to stand in the way of the doctrine of military necessity.

Popular Participation. The size and complexity and the economic structure of urban mass societies create numerous problems which have taxed man's patience and his loyalty to the democratic ideal. Among these is the fear that the individual will be lost to sight in the large corporation or unit of government. Jean Jacques Rousseau, a believer in small political units, offered the following opinion in his *Social Contract* (1762): "Were there a people of gods, their government would be democratic. So perfect a government is not for men." This pessimistic view discounts the issue of levels in government and ignores the fact that the direct, or pure, democracy of the town meeting variety can be employed at one level of government while various other representative forms must and can be used at other levels. For example, in various states the initiative (permitting voters to enact laws at the polls) and the referendum (a requirement that a certain bill enacted by the legislature obtain the support of the electorate before becoming law) as well as the recall (the removal of a public official by the voters prior to the expiration of his term of office) have been employed as means of increasing popular participation in and control of government. While these devices have not been employed in the federal government their continued existence in many states, as well as the fact that Nebraska has a unicameral legislature while all other states adhere to bicameralism, indicates that a healthy diversity is characteristic of democratic society irrespective of its size.

CURRENT DEMOCRATIC GOVERNMENT IN ENGLAND

Although the United Kingdom has a monarchy, a hereditary aristocracy, and a form of state church, it is a constitutional regime in which the monarch reigns but does not rule. In Great Britain the supremacy of parliament is not subject to any constitutional check, such as the judicial review of legislative acts in the United States. The House of Commons could then, theoretically, annul the Bill of Rights and all other democratic liberties. However, democracy is so much a part of British life that the majority party in parliament would not think of violating the spirit of Great Britain's unwritten constitution. While British democracy does not differ in the basic essentials from its American offspring, there are certain important dif-

ferences in its governmental structure. See GREAT BRITAIN, Administrative Factors.

In the United States under the presidential system, the members of the executive cannot be members of the legislative branch. Terms of office are fixed and can be shortened only by death, disease, or impeachment. In England although a parliament may sit for five years (war caused the 1940 elections to be postponed until 1945), its life may be shortened should the cabinet receive a vote of no confidence in the House of Commons or too small a majority on an issue of importance. Dissolution then occurs and a new election is required. This was the case in 1951 when the Labour party received too small a majority in the 1950 election to govern effectively and was replaced by a Conservative government. Since party discipline is effective, votes of no confidence are rare in British politics, whereas in the United States many members of the president's party may vote against legislation proposed by him. In England the House of Lords has been stripped of most of its power although it has a suspensive veto of one year's duration (one month in the case of money bills) which can be overridden by the House of Commons; however, bicameralism and a strong Senate characterize the American government. The powers of Great Britain's hereditary and appointive body have dwindled steadily since 1911. Prior to that year it had enjoyed an absolute veto over all legislation and it is still of great importance as the final court of appeal for the United Kingdom.

The prime minister, unlike the American president, must, together with his ministers, answer questions on the floor of the House of Commons which have been put in writing by the members; "question time," which occurs several days each week and lasts one hour, is an effective medium for airing grievances and a means of controlling the executive. In the United States the presidential and other press conferences and congressional investigations perform a similar function but probably with less continuity and effectiveness. The prime minister as head of the government is freed from many ceremonial duties which are performed by the monarch, while in the United States the president as the head of government must assume many of these tasks. The British prime minister is always leader of the majority party in the House of Commons while the American president's party may be in a minority in either or both houses of Congress. (See PRIME MINISTER.) The British political system demonstrates that the separation of powers principle and federalism as well as bicameralism, however essential they may appear to be in American democracy, are not absolutely essential to democratic government.

Labour Government. The social and economic measures effected by the Labour government in 1945–50 continued certain basic changes in which again American and British democracy differ, although only in degree. During that period the electrical industry, the railways, most of the airlines, and the central bank as well as the iron and steel industries were nationalized; however, in 1953 the Conservative government denationalized iron and steel. A comprehensive health program providing for medical and dental care largely financed by tax funds was also established by the Labour government. The difference is one of degree because in the United States the Tennessee Valley Authority is a governmental body selling electric power; the social security system operates a vast public insurance program; and the Department of Agriculture spends public funds in order to maintain farm income at something approaching an appropriate level.

DEMOCRACY IN FRANCE

The tradition of the Revolution of 1789 is still a formidable factor in French politics. The fact that the Revolution led to the establishment of two ill-starred French empires in the nineteenth century created distrust of a strong executive under the Third Republic (1876–1940) and also following World War II when both the Communists and rightists unsuccessfully advocated an executive with greatly enlarged powers.

The opportunity to effect reforms in 1946 when the present French Constitution of the Fourth Republic was drafted led to certain minor changes. The powers of the upper legislative chamber, formerly the Senate and now the Council of the Republic, were limited by the 1946 constitution. Under the Third Republic the Senate had the power to unseat cabinets and did so on occasion; the 1946 constitution states explicitly that the cabinet is not responsible to the Council of the Republic but only to the lower house, the National Assembly. Under the Third Republic there was no right of dissolution of parliament employed by the cabinet as a weapon to enforce discipline among the deputies by threat of new elections. The limited power of dissolution in the 1946 constitution is exercisable only if two ministerial crises (votes of no confidence leading to the resignation of two cabinets) occur within 18 months following the first 18 months after a parliamentary election. Some French cabinets under the Fourth Republic have lasted as long as nine months or one year while others have lasted no more than one or two months. Instability was greatest during the first 18 months of the Fourth Republic following nationwide parliamentary elections, during which dissolution is not permitted. The instability of the French cabinets can be exaggerated, especially when it is considered that the permanent civil service enables the government to function during a ministerial crisis and that many of the same figures reemerge in the new cabinet although with different portfolios. See also FRANCE, History.

Coalition Government. French democracy has a multiparty system in which no fewer than two or three groupings may comprise any cabinet; at one time each of at least five parties in the National Assembly may hold no fewer than 70 seats in that body of more than 600 members. Among the reasons for this phenomenon are the fact that French parties tend to represent specific social classes (France is a society in which lines of social cleavage are strongly evident and important) as well as the ideological differences which characterize the electorate. Many French workers and individualist peasants have recently voted Communist (giving that party the largest number of seats in the National Assembly and one quarter of the total popular vote) largely as a protest against particular economic policies and poor housing. Religion is another source of cleavage with the existence of a separate Catholic party, the M.R.P.; also various rightist groups have refused to reconcile themselves to the existence of the republic. This has led to a marked lack of national unity. But while democratic government has many enemies in France the proponents of democracy, however much they may disagree among themselves, have on innumerable occasions been able to rally a successful defense of the republic. See GOVERNMENT; LAW; UNITED STATES HISTORY.

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DEMOCRATIC PARTY, the oldest political party in the United States, existing since the earliest days of the nation and usually one of the two major parties

in the characteristic two-party American polity. The inchoate party which already had begun to take shape under the leadership of Thomas Jefferson was given the name Republican by him in a letter to Washington in 1792. During the Revolution, and even by the time of the constitutional convention, the word democracy was seldom used; Jefferson himself feared that government by a simple popular majority could be despotic in nature, and particularly distrusted "the mobs of the great cities." By about 1810, however, the word democratic was becoming popularly equivalent to republican, though the party of Jefferson did not become officially Democratic until Jackson became president. See JEFFERSON, THOMAS.

Jeffersonian Democracy. The Jeffersonian Republicans were drawn from those elements opposed to the domestic and foreign policies of the Federalists. They came largely from the sparsely settled southern and western regions in which agriculture was the chief economic interest, but also included small tradesmen and mechanics of the coastal towns. The new party absorbed some of the remaining anti-Federalists, whose original cause had been lost after the successful organization of the federal government. To Jefferson the difference between his party and the Federalists was the difference between republicanism and monarchy or aristocracy, between government by the people and government of the people. To his party —and the country—he gave the slogan, "Equal rights for all, special privileges for none." A fundamental doctrine was the strict interpretation of the Constitution, involving the principle that all powers not explicitly granted to the national government adhered to the individual sovereign states. But this and other tenets were subject to modification and change during the party's long history. See STATES' RIGHTS.

For 60 years after his election in 1800, the party founded by Jefferson retained the presidency, except after the elections of 1840 and 1848. Until his death in 1826, he was the guiding spirit behind the party's policies and activities, and he was instrumental in the choice of Madison and Monroe as his successors. The Federalists, meanwhile, had vanished from the political scene, and in the ranks of the Republican party, which dominated the country, differences of principle came to be identified with the names of individual leaders. Followers of John Quincy Adams and Henry Clay, who favored expansion of the powers of the federal government, in 1824 formed a group known as the National Republican Party, a name changed in 1834 to Whig Party, while opposing groups, rallied under Andrew Jackson, called themselves Democratic-Republicans and, soon, simply Democrats. Not until the national convention of 1844, however, did the party formally proclaim itself the Democratic party and dispense with all reference to Republican connections.

"A LIVE JACKASS KICKING A DEAD LION."

And such a Lion! and such a Jackass!

HARPER'S WEEKLY

Democratic donkey first appeared in *Harper's Weekly* in 1870.

Jacksonian Democracy. The election of Jackson in 1828 and again in 1832, since he was regarded as the people's champion, brought changes in the government which have been hailed by some persons as a true introduction of democracy. Previous leaders, such as Jefferson, Madison, and Monroe, however democratic in principle, had an aristocratic background of breeding, education, and social position. Under Jackson, and aided by an extension of the suffrage and other manifestations of the democratic spirit, the masses came into their own. Further departing from Jeffersonian precedent, Jackson first introduced the spoils system on a large scale, developing the principle that victors at the polls were entitled to their predecessors' political jobs. See JACKSON, ANDREW.

The Two-Party System in Operation. Van Buren received the mantle of Jackson in 1836, but in 1840 the Whigs elected Harrison and, after the Democrats had won with Polk in 1844, the Whigs elected Taylor in 1848; but the Democrats succeeded in 1852 and 1856 with Pierce and Buchanan. In fundamental issues of this period the Democrats in general favored: low tariffs in the interest of the farmers, instead of high tariffs for the protection of "infant industries"; state banks and currency instead of national; free land, as opposed to sale for revenue purposes. Over the great issue of slavery, in particular the status of slavery in the territories, the Democratic party split completely, and put forward two presidential tickets in 1860, resulting in the election of the new, anti-slavery Republican party.

During the Civil War most Northern Democrats supported the Lincoln administration and were known as War Democrats; but to many Republicans all Democrats were Copperheads. The mistakes and corruption of the Reconstruction era led to a strengthening of the Democratic party in the economically resurgent South and since 1877 the "solid South" has been a mainstay of Democratic power. In 1876 the party cast a popular majority for Tilden, but it acquiesced in the electoral commission's decision which gave Hayes the presidency. From 1860 to 1912 only one Democrat, Grover Cleveland, was elected to the White House (1885–89 and 1893–97). Except for two terms, however, the party controlled the House of Representatives during 1875–95. In 1896 and 1900 the Democrats, led by Bryan, contested and lost on the issue of free coinage of silver; and in the period following 1898 they also opposed Republican "Imperialism."

Wilson and Roosevelt. In 1912 because of a split in the Republican ranks Wilson was elected over Taft and Theodore Roosevelt; his first administration was marked by a large body of constructive legislation, his second, by the nation's participation in World War I. Largely because of war weariness and recoil from Wilson's internationalism and "new freedom," the public in 1920 returned to "normalcy" and to the Republican party, which maintained its position during the ensuing period of prosperity. As a result of the economic depression that followed the crash of 1929, the people turned in 1932 to Franklin D. Roosevelt and his promise of a "new deal" for the "forgotten man." Despite its pledge of economy the new Democratic administration immediately began to raise taxes and the public debt to finance relief projects for various elements of the nation and later, when the country was plunged into history's greatest war, to carry on the hostilities. The Roosevelt regime was marked by the introduction of social security, great changes in the status of labor, banking and financial regulation, prohibition repeal, commitment

STEVENSON-KEFAUVER CAMPAIGN COMM.

Party workers and others surround the Democratic party's candidate for the presidency, Adlai E. Stevenson, at his Chicago campaign headquarters during the 1956 convention.

to international co-operation, and perforce (and counter to Democratic tradition) by broad interpretation of the powers of the federal government. Harry S. Truman, Democrat, became president upon the death of Roosevelt in 1945. The ensuing years saw the development of a cleavage within the Democratic party between Northern and Southern elements. Since the Southern wing in Congress often sided with the Republicans on domestic policy in what Roosevelt had referred to as an "unholy alliance," a conflict resulted between the president and Congress which characterized the Truman administration. Only in foreign affairs was there some unity, Congress generally supporting the bipartisan foreign policy.

In 1946 the Democrats lost control of Congress to the Republicans. In 1948, President Truman won election in one of the biggest political upsets in U.S. history; however, his Fair Deal program, emphasizing extended federal power and civil rights legislation, caused him to lose four Southern states to a States' Rights Democratic party. The Democrats retained control of Congress in 1950, although actual power rested with an antiadministration combination of Republicans and some Democrats.

When President Truman declined to run for reelection in 1952, the nomination was thrown open to a large number of aspirants. At the Chicago convention in July Adlai E. Stevenson, a moderate, was nominated as one who could hold together the Fair Deal and anti-Fair Deal elements of the party. But the popularity of the Republican candidate, Dwight D. Eisenhower, together with charges of corruption, dissatisfaction over the Korean War, and a general feeling that it was time for a change, proved too much. The Democrats won the electoral votes of only nine states, losing in such "Solid South" Democratic strongholds as Virginia, Florida, and Texas. They lost control of Congress by only a few seats.

The Democrats in 1952, in the role of minority party, appeared to be more united than they had been as the majority party. In the congressional election of 1954 the party regained control of both houses of Congress. In general, the party co-operated with the Republican administration in its request for bipartisanship, particularly in the field of foreign affairs. In 1956 Adlai E. Stevenson was for the second time chosen the Democratic party's nominee for president. President Eisenhower, his personal popularity undiminished, defended his administration in the campaign, stressing the themes of peace and prosperity. He was again elected by a wide popular majority, receiving 457 electoral votes (41 states) as against 74 electoral votes and seven states for Stevenson. The Democratic party, however, elected slight majorities in both houses of Congress. This was the first time since 1848 that the party electing the president failed to secure a majority in at least one house. See Political Party; Republican Party; U.S. History. Irving Fryer

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DEMOCRITUS, 460?–?357 B.C., pre-Socratic Greek philosopher, was a native of Abdera, Thrace (and is often called the Abderite for this reason). Democritus was called the Laughing Philosopher since, it is said, he was wont to laugh much at the follies of mankind. His ethical system, which made pleasure tempered by the avoidance of excess and the cultivation of temperance, uprightness, and nobility, the principal goal of life shows his disposition was more cheerful than morose. In the twentieth century, Sigmund Freud maintained that, apart from what *ought* to be, man in fact does live according to the "pleasure principle" mitigated, normally, by what he called the "reality principle"—a description which bears a striking resemblance to Democritus' ethics.

Democritus' vast inherited wealth enabled him to live as he pleased, and he was pleased to pursue knowledge. Some sources call him the most learned man of his time. He wrote (according to Diogenes Laertius) some 72 works on grammar, physics, mathematics, and ethics; however, only a few fragments of his writings are extant. Much of what is known of his views is derived from what other writers have said about him.

Democritus is remembered as perhaps the most consistent materialist in the history of Greek thought. Although his atomistic physical theory was in part derived from the views of Leucippus; Democritus must be credited as being the real founder of atomism (see Atomism). He saw the cosmos as consisting solely of an infinite number of underived, imperishable, irreducible atoms in constant and eternal motion within a void necessary to give atoms space in which to move. The *reality* of any substance consists of its atoms; the *qualities* of a substance (such as color, flavor, odor, temperature, and degree of hardness) Democritus considered conventional and essentially derivative; the *aliveness* of a substance depends upon and consists in the constant motion of its constituent atoms. The rule of Democritus' atomistic cosmos is that of mechanical necessity; concepts such as purpose, mind, and providence were rigorously excluded from his system. Nothing existed, nothing happened that was not for Democritus wholly explicable in terms of mechanical necessity. The gods *do* exist, said Democritus, but they are mortal and along with everything else, are made up of atoms—although perhaps atoms of finer stuff than that of which human beings are constituted. The soul is but an atomistic epiphenomenon of an atomistic body and at death perishes with that body.

Although materialism and idealism are usually considered to be opposites, it is clear that Democritus' materialism is in a sense idealistic by reason of the serenity of his mechanical universe. Democritus' idea does not rule the mechanism; it is an orderly mechanism. Living at his ease, Democritus could not conceive of nature as chaotic, a notion central to the viewpoints of most Greek pessimists and later of Christianity. He liked the world and the way it worked, and could afford to laugh at the follies of men less materially fortunate than he.

DEMOGRAPHY is the statistical analysis and description of the vital processes and movements of human population. As first used by Achille Guillard in 1855 in Paris, demography referred to the science of population figures merely as the mathematical

knowledge of the social and physical conditions of populations and their movements.

In speaking of a group of human beings as a population, reference is made only to their existence as a group of persons in a certain area, or as a "spatially delimited aggregate." A demographic populational analysis of a human group or society yields a quantitative, or statistical account of the number, composition, and distribution of the members or of the rates of change in those respects. It provides a continuous inventory and describes the structure of differences in characteristics in the group or, if movement is the object of attention, the mechanics of change. A comparative analysis by a demographer is undertaken for the purpose of producing general theories or propositions concerning the factors and processes influencing a given population and the trends occurring within that population.

Sources of Data. The demographer relies mainly on data derived from census enumeration and registration and vital statistics. The analysis of census data provides information on population size, distribution, and composition at a given moment in time, and an accurate description of the changes taking place through time. The analysis of registration data on births, deaths, marriages, divorces, and migrating movements reveals the nature of the mechanisms operating to maintain the population structure or to produce changes in it. See CENSUS; VITAL STATISTICS.

Historical Beginnings. The United States in 1790 pioneered in the collection and analysis of census data on a national scale in order to comply with U.S. Constitution requirements for proportional representation in the lower house of Congress. In recent years the U.S. Census Bureau has experimented with the use of sampling procedures in the decennial census and in surveys in the intercensal years. (See SAMPLING TECHNIQUE.) The collection of registration data is a recent development; birth statistics, collected on a national basis only since 1930, still present a problem because of incomplete registrations.

Uses of Demography. In addition to its scientific and sociological applications, demography has many practical uses. Much of the information necessary for computation of actuarial tables used in the life insurance field, for example, comes from detailed knowledge of the incidence of death by age, sex, and cause. Business uses demographic data in market analysis in particular and in the management of public service functions there is a great need for accurate analysis and prediction of the growth, decline, and geographic shifts of population. See CITY PLANNING; INSURANCE, Life Insurance, *Calculation of Premium* and *Mortality Tables;* MARKET RESEARCH, *Techniques in Market Research;* POPULATION, *Effect of Modern Science.* HAROLD W. SAUNDERS

DEMOISELLE, any one of several tropical marine fishes belonging to the family *Pomacentridae.* These brightly colored fishes inhabit coral reefs and tide pools. Examples of demoiselles include beau-gregory, *Eupomacentrus leucostictus;* garibaldi, *Hypsypops rubicunda;* and clownfish, *Amphiprion percula.* Demoiselle is also a crane that is noted for its weird courtship dance. See CRANE.

DEMOLITION, the deliberate destruction of buildings and other structures. In civilian life demolition is an established commercial activity concerned with tearing down structures that have become unsafe or are to be replaced. In warfare it is used in both offensive and defensive operations.

Civilian Demolition companies, or wrecking companies, operate mainly in cities. Most of their work consists of tearing down buildings for private owners and for agencies of the local government. They also contract with county, state, and federal government agencies to remove structures such as bridges.

Wreckers usually start demolishing a building by stripping it of articles that have resale value (doors, windows, hardware, and so on), which they sell to salvage dealers. If it is a frame building they then remove the partitions, roof, siding, and finally the frame by hand. Large masonry buildings are usually battered to pieces with a heavy ball on the end of a cable swung by a crane. The debris is loaded into trucks and hauled to a disposal area. Building frames, bridges, and other structures that are built of steel are cut up with gas torches (see FLAME CUTTING). The pieces are sold as salvage or for scrap. Masonry piers and abutments may be removed by blasting. See BLASTING.

DU PONT

Masonry and reinforced concrete structures are quickly demolished by a heavy ball suspended on a cable swung by a large crane. Casements and hardware are removed first.

Military Demolition is usually accomplished by blasting with high explosives. As a defensive land operation it is used by retreating forces to demolish bridges, roadways, railroads, dikes, dams, buildings, and airport runways. This delays the enemy's advance and forces him to divert supplies and personnel for reconstruction. In offensive operations, military engineers blast fortifications, tank obstacles, and other defenses (see MILITARY ENGINEERING). Guerrilla and underground forces harass the enemy by blasting his communication lines, storage areas, and military installations. See SABOTAGE; UNDERGROUND.

In naval operations, amphibious landings have sometimes been preceded by demolition of beach obstacles with explosives planted by swimmers equipped with breathing apparatus (see DIVING, *Self-contained Equipment*). Ships operating in combat areas carry demolition charges that can be exploded to prevent their capture. Ships also have been sunk in this way to block enemy harbors and to form breakwaters for landing operations.

DEMONETIZATION, the abandonment of a given metal as a monetary standard or the withdrawal of coin of that metal from circulation. When a metal is demonetized, it is no longer the measure of the monetary unit and loses the right of free coinage and its status as full legal tender. In 1873, when the supply of silver was so low that practically no silver was being minted, the silver dollar was dropped from the list of coins; the later increase in supply led to a long controversy over the free coinage of silver. Governments may withdraw coins from circulation as was done in England in 1889 when all pre-Victorian gold coins were withdrawn and in the United States in 1933 when gold was withdrawn from domestic circulation.

DEMONOLOGY, belief in the existence and operation of demons or evil spirits and the study of such beliefs. Belief in spiritual beings inferior to the gods and capable of influencing human affairs is common to very many religions and civilizations. Some such spirits were regarded as neither good nor evil; some possessed attributes of both good and evil; often, a sharp distinction was made between good spirits or angels and evil spirits or demons.

Ancient Babylonian and Assyrian religious beliefs included numerous demons and priests performed incantations to protect the people from these evil spirits. Zoroastrians in Persia believed in a constant warfare between good and evil spirits. (See ZOROASTRIANISM.) Chinese folk religion included a large number of devils to be placated or avoided. Many demons in folk beliefs are connected with dangerous or unfavorable aspects of nature and are regarded by anthropologists as related to animistic belief. See ANIMISM.

The Old Testament mentions demons comparatively briefly and rarely. Later Judaism included accounts of a great number of demons, including the fallen deities of other peoples, fallen angels, and the spirits of the wicked dead. These invisible spirits, whose leader was Satan, were everywhere and responsible for human ills.

In the New Testament demons are presented as personal spirits that beset men and even possess them. On several occasions Jesus drove demons out of possessed persons (Mark 5:1–17; 9:16–26; Luke 8:2). The power of casting out devils was among those given to the apostles. In the early Christian church persons believed to be possessed by a devil were put under the care of an exorcist, a man who had received special clerical rank and orders. The ceremony of exorcism, which still exists in Catholic ritual, was performed to relieve possessed persons. See EXORCISM.

Cults of the demons in which worshipers strive to obtain the favor of the evil spirits have developed in many lands. In some cases these are regarded by students as survivals of older and defeated religions. See DEVIL; SATANISM; WITCHCRAFT.

DEMOPOLIS, city, W central Alabama, in Marengo County, on the Tombigbee River at the mouth of the Black Warrior River, on the Frisco and the Southern railroads and U.S. Highway 43; 48 miles SSW of Tuscaloosa. The principal industries are food and wood products and building materials. Demopolis was founded in 1818 by exiled French aristocrats. The city has fine examples of Greek Revival mansions, built in the 1830s and 1840s. Pop. (1950) 5004.

DEMOSTHENES, 384?–322 B.C., Athenian orator and statesman, was born in Attica. In preparation for a lawsuit against some relatives who had defrauded him, Demosthenes studied oratory, probably with the great orator Isaeus; the experience he gained during the litigation led him to a career in logography, writing pleas for others to use in court cases.

Demosthenes' career as a politically powerful orator began in 351, when he delivered his first *Philippic* against Philip of Macedon, with whom the Athenians had been waging a rather desultory war for several years. Demosthenes exhorted the Athenians to rouse themselves from their false security; indeed, he demanded that the war be extended to Thrace, but his demands went unheeded. This speech was followed by the *Olynthiacs*, a plea for the defense of Olynthus, but when the city fell before the advance of Philip the Athenians sued for peace and Demosthenes was sent to Macedonia as one of 12 ambassadors. The ensuing treaty, the Peace of Philocrates, was most unpalatable to the fiery orator, who regarded it as no more than a breathing spell between battles. With the second and third *Philippics* (344 and 341, respectively) he succeeded in having the peace treaty annulled, increasing military appropriations, strengthening the navy, gaining Thebes as an ally against Philip, and in establishing himself as the most influential political leader of Athens. In *The False Embassy* (343) he berated his fellow ambassador Aeschines for lacking patriotic fervor during the peace mission. The *Fourth Philippic* (340) was virtually a declaration of war—one which led to another Greek defeat at the hands of the Macedonians.

HISTORICAL PICTURES SERVICE
Demosthenes

In 336 Ctesiphon proposed that Demosthenes be awarded a golden crown in recognition of his patriotism, but Aeschines contested the legality of the proposal. In 330, when the issue finally came to a head, Demosthenes delivered his most famous oration, *De Corona* (On The Crown), a defense of his whole career; his eloquence and logic were so persuasive that the humiliated Aeschines exiled himself. But in 324 Demosthenes' political influence declined markedly. One Harpalus, who had been appointed guardian of a huge treasure by Alexander the Great, absconded with the loot and sought refuge in Athens; Demosthenes insisted upon harboring the fugitive and as a result was accused of having accepted a bribe from Harpalus. The orator was tried, found guilty, and fined 50 talents, which he could not pay. He fled to Aegina, where he remained until the death of Alexander, whereupon the Athenians recalled him. Returning in triumph in 323, he called for a new war with Macedonia. In it the Greeks were defeated by Antipater, who demanded that Demosthenes be surrendered. Again he fled, this time to Calauria. Followed by Antipater's agents, he poisoned himself to avoid capture and certain execution.

Demosthenes was the greatest orator of antiquity; those of his orations which have come down to us in their original form are overpowering in their expository brilliance. The wisdom of his statesmanship was sometimes questionable; his views were often shortsighted and motivated too much by personal hatreds; and his all-consuming patriotism made him unduly uncompromising in his dealings with Macedonia.

F. D.

DEMOTIC ALPHABET. See HIEROGLYPHICS.

DEMPSEY, JACK, real name William Harrison Dempsey, 1895– , U.S. heavyweight prize fighter dubbed the Manassa Mauler, was born in Manassa, Colo. One of the most colorful fighters in history, he decisively won the world's heavyweight championship from Jess Willard on July 4, 1919, at Toledo, Ohio, and lost the title to Gene Tunney at Philadelphia, Pa., on Sept. 23, 1926. Dempsey's fights with Georges Carpentier, Luis Firpo, Jack Sharkey, and Tunney attracted million dollar gates. In 1938 he was awarded the Edward J. Neil annual award for having "done the most for boxing." During World War II Dempsey directed the U.S. Coast Guard physical fitness program. He later counseled boys vocationally.

DEVRY TECHNICAL INST.
Jack Dempsey

DEMULCENT, any one of several compounds used therapeutically to coat and thus protect irritated or injured tissues. Demulcents may also be used in conjunction with various drugs. Substances such as glycerine, tragacanth, lanolin, and gum arabic are demulcents.

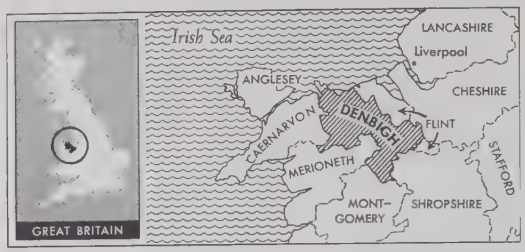
DEMURRAGE, the compensation paid to the owner of a ship for its detention by the charterer beyond the number of days allowed for loading and unloading or, if no time is specified, beyond a reasonable length of time. The amount payable as demurrage is generally fixed by the charter party at so much per day. It is payable by the shipper if he has contracted to load or unload within a certain number of days and has defaulted, even though the delay has been unavoidable, but not if the delay has arisen through fault of the shipowner or his representative. Demurrage is also charged for freight cars remaining on railroad sidings beyond the specified time allowed by the railroad company for loading or unloading.

DEMURRER is an objection that the pleading against which it is directed is insufficient in law to support the action or defense, and that the demurrant should not, therefore, be required further to plead. It is not the purpose of the demurrer to set out facts, but it must stand or fall by the facts as alleged in the opposing pleading and can raise only questions of law as to their sufficiency. The demurrer is an allegation that, admitting the facts of the preceding pleading to be true as stated by the plaintiff, the plaintiff has yet shown no cause why the defendant should be compelled by the court to answer. However, such admission of facts is not binding on the demurrant. The import of the demurrer is that the objecting party will not proceed, but will await the judgment of the court. It is a fundamental rule of law that a demurrer will be valid only for defects which appear on the face of the alleged defective pleading, and extraneous or collateral facts stated in the demurrer cannot be considered in deciding upon its validity.

Under revised procedure adopted by various states, demurrer is abolished and its function is now fulfilled by motion for judgment as the rules provide. Thus objections formerly taken by demurrer may now be taken by the much simpler procedure of a motion for judgment dismissing or striking a pleading or a cause of action, defense, or counterclaim. However, three objections which were formerly grounds for demurrer are now grounds only for a corrective motion to amend and not for the more drastic remedy of motion for judgment: namely, misjoinder of parties plaintiff, defect of parties plaintiff or defendant, and misjoinder of causes of action.

DENAIN, town, N France, in the department of Nord, on the Scheldt River; 27 miles SE of Lille. Situated in the Sambre-Meuse coal field, Denain is a transportation and industrial center. Its chief manufactures are steel, railroad equipment, machinery, and armaments; there are sugar refining, coal mining, and brewing industries. Pop (1954) 27,449.

DENATURED ALCOHOL. See Alcohol.



Location Map of Denbighshire

DENBIGHSHIRE, or Denbigh, county, NE Wales, bounded by the Irish Sea on the N, Flintshire, Cheshire, and Shropshire on the E, Montgomeryshire and Merionethshire on the S and SW, and Carnarvonshire on the W; area 669 sq. mi.; pop. (1951) 170,699. The county consists largely of upland, with peaks above 2000 feet in elevation. Lowlands occur in the north, along the coast, and in the river valleys, principally the fertile Vale of Clywyd. Oats, barley, wheat, and root crops are cultivated on the lowlands. The higher sections of the county are mainly devoted to raising sheep and cattle. Mineral resources of the region include coal, iron, lead, zinc, copper, kaolin, and slate. Coal, the most important mineral product, is mined in the Wrexham district. Denbighshire is noted for its scenic beauty and attracts many tourists. Colwyn Bay is the principal vacation resort. Denbigh is the county seat. Other leading towns are Abergele, Ruthin, Llangollen, and Llanwrst. Denbighshire has numerous antiquities and historic remains, including many Roman relics and several ancient monastic buildings and medieval castles.

DENBY, EDWIN, 1870–1929, U.S. cabinet official best known as a key figure in the Teapot Dome affair, was born in Evansville, Ind., and was Pres. Warren G. Harding's secretary of the navy after 1921. Denby's signature on leases of Teapot Dome oil lands involved him in the scandal and, although not formally charged with corruption, he resigned his office on Feb. 18, 1924. See Teapot Dome Scandal.

DENDERA or **DANDARA,** ancient Tentyra, village, Upper Egypt, in the province of Qena, on the left bank of the Nile River, opposite Qena; 36 miles N

GADDIS AND SEIF

Façade of the Temple of Hathor at Dendera, Upper Egypt

of Luxor. Dendera is famous for its ruined temple of Hathor, one of the most magnificent and best preserved antiquities of Egypt. The temple dates from the first century B.C. Its walls and columns are covered with hieroglyphics and figures. A well-known table of zodiacal signs, now in Paris, was removed from the temple early in the nineteenth century. There are numerous other antiquities in the area, among them a temple of Isis. Pop. about 17,000.

DENDERMONDE, town, N Belgium, in the province of East Flanders, at the confluence of the Scheldt and the Dender rivers; 17 miles NW of Brussels. Dendermonde is a textile center, especially noted for cotton spinning and carpet weaving. In 1667 the town successfully resisted a siege by Louis XIV. In 1706 it was taken by Marlborough. Pop. (1950) 9413.

CHICAGO NATURAL HIST. MUS.

Dendrites on Limestone

DENDRITE, or dendritic marking, in geology, a plantlike branching frequently found in the joints and at the division planes of rocks. Dendrites are a result of the infiltration of solutions of iron and manganese into cracks from which they have subsequently evaporated or crystallized out in varied forms. Similar markings are found in agate or chalcedony forming the variety known as moss agate. Groups of crystals such as silver also assume dendritic form when precipitated from solutions. Dendrites are also branches from nerve cells. See NERVOUS SYSTEM.

DENDROBIUM, a genus of about 600 species of popular greenhouse orchids, family *Orchidaceae*. These easily grown, epiphytic plants are native to Japan and southwestern Asia. See EPIPHYTE; ORCHID.

DENEB, the brilliant white star in the constellation Cygnus (see CYGNUS) that appears at the top of the Northern Cross. It is one of the most luminous stars known, a supergiant 4800 times as bright as the sun. Deneb, or alpha cygni, is 400 light-years away from the earth and has a visual magnitude of 1.3. See LIGHT-YEAR; MAGNITUDE.

DENFELD, LOUIS EMIL, 1891– , U.S. naval officer, was born in Westboro, Mass. After destroyer duty in World War I, he commanded a battleship division in the Pacific and became chief of naval personnel in 1945. Denfeld was chief of naval operations, 1947–49, but resigned after a dispute with Louis A. Johnson, secretary of defense, over unification of the armed forces.

D'ENGHIEN, LOUIS. See ENGHIEN, LOUIS ANTOINE HENRI DE BOURBON, DUC DE.

DENGUE FEVER, often called dandy or breakbone fever, is an acute, usually nonfatal disease transmitted by *Aedes* mosquitoes and caused by a filtrable virus. The onset of dengue fever is sudden although the incubation period usually varies from 4 to 10 days. The disease is characterized by prostration, a sudden fever that subsides for a few days only to rise again, and a rash that appears after the second fever rise. Severe headache occurs behind the eyes and there is severe pain in the muscles of the back and in the joints. Fatigue is often present. The disease seldom lasts longer than seven days, and there is no specific treatment. Since dengue fever is transmitted by the mosquitoes *Aedes aegypti* and *A. albopictus*, mosquito control is the best preventive.

DEN HAAG. See HAGUE, THE.

DEN HELDER. See HELDER.

DENIS, SAINT, third century, the patron saint of France, first bishop of Paris, and apostle to the Gauls. He met martyrdom in Lutetia (now Paris) at the order of the Roman provincial governor while carrying out an apostolic mission. In 636 King Dagobert founded on the supposed site of the martyrdom an abbey which became the sepulcher of the French kings. Denis has often been confused with Dionysius the Areopagite, bishop of Athens. The feast of St. Denis is celebrated on October 9.

DENIS, MAURICE, 1870–1943, French painter and critic, was born in Granville. Denis was one of the group known as the *Nabis* (prophets) who formulated the "Theory of the Two Distortions," essentially an explanation of the subjective (for spiritual reasons) and objective (for technical reasons) distortions of nature found in paintings such as those of Gauguin. Denis' own painting was much influenced by Gauguin, but also had elements of a neoclassical mysticism well suited to his tendency to choose religious subject matter; he was called the renovator of religious art in the twentieth century. Among his best-known paintings are the murals in the church at Le Vésinet (1903). His aesthetic theories were set forth in *Théories* (1913) and *Nouvelles Théories* (1922).

DENISON, city, W central Iowa, county seat of Crawford County, on the Boyer River; the Illinois Central and the North Western railroads, and U.S. highways 30 and 59; 63 miles SE of Sioux City. Denison is a market center for livestock. Manufactures at Denison include kitchen cabinets and sinks. Pop. (1950) 4554.

DENISON, city, NE Texas, Grayson County, on the Red River; the Frisco, the Kansas, Oklahoma, and Gulf, the Missouri-Kansas-Texas, the Southern Pacific, and the Texas and Pacific railroads; and U.S. highways 69 and 75; 5 miles south of the Oklahoma state line and 67 miles NNE of Dallas. A railroad center, Denison is one of the chief shipping points of the Red River Valley. The principal manufactures are textiles, clothing, furniture, mattresses, and air conditioning equipment. Meat packing, dairy production, edible oil refining, and food processing are other industries. Denison is the birthplace of Pres. Dwight D. Eisenhower. Perrin Air Force Base is located 8 miles west of the city. Nearby is Lake Texoma, formed by Denison Dam on the Red River. Pop. (1950) 17,504.

DENISON DAM. See RED RIVER.

DENISON UNIVERSITY. See COLLEGES AND UNIVERSITIES.

DENIZLI, province, SW Turkey, bounded by the provinces of Kütahya and Manisa on the N, Afyon Karahisar on the NE, Isparta and Burdur on the E, Muğla on the S, and Aydin on the W; area 4244 sq. mi.; pop. (1955) 368,853. Denizli, mostly mountainous, is drained by the Menderes, the Ak, and the Dalaman rivers. There are scattered deposits of chromium, sulfur, copper, and lignite. The main occupation is agriculture, especially the production of grains, cotton, and raisin grapes. The capital and largest city is Denizli.

SWEDISH AMERICAN LINE

DENMARK

This most southerly of Scandinavian nations exports porcelain, bacon, and dairy staples.

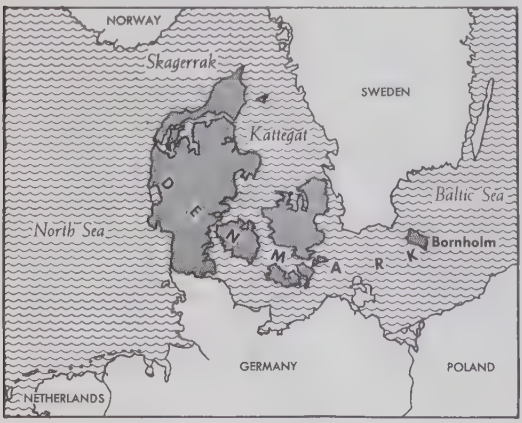
DENMARK, Danish Danmark, kingdom, NW Europe, bounded on the N by the Skagerrak, on the E by the Kattegat, The Sound, and the Baltic Sea, on the S by Germany, and on the W by the North Sea; area 16,576 sq. mi.; pop. (1955 est.) 4,347,000. Denmark consists of the peninsula of Jutland and the islands of Bornholm, Fyn (Fünen), Sjaelland (Zealand), Als (Alsen), Lolland (Laaland), Falster, Möen (Møn), and others. Denmark with the Faeroe Islands and Greenland constitutes the kingdom of Denmark. The capital is Copenhagen. For the Danish flag in color, see FLAG. See map in Atlas, Vol. 20.

PHYSICAL FACTORS

Geology and Topography. With the exception of the island of Bornholm, Denmark is underlain by pre-Cambrian rock that has been covered with thousands of feet of sedimentary rock. On Bornholm the pre-Cambrian rock is thinly covered with glacial material and in the northwest the rock is exposed. All of the area was covered during early glacial advances of the Pleistocene epoch; however, the western half of Jutland was not covered in the last advance of the ice. The eastern Danish islands are the last remaining evidences of the former land bridge between Jutland and Sweden that existed during the period when the Baltic was an inland sea.

Coat of Arms of Denmark

The surface of Denmark is generally flat to rolling and covered with morainic and glacial wash material, except for part of Bornholm. The highest point (567 ft.) in Denmark is on Jutland about 8 miles north of the city of Horsens in the center of the Silkeborg Hills, which extend to the north and south. Western Jutland is an area of extensive plains covered with gravel and sand that remained after flooding from melting glaciers. Those areas not flooded remained as low flat hills. North of the Lim Fjord on Jutland there are two distinct terraces representing former levels of the sea. The terrain of eastern Jutland and of the islands off the coast is chiefly hilly moraine with several small lakes and old melt water troughs. Danish fiords are believed to be drowned tunnel valleys, differing in origin from the Swedish and Norwegian fiords, which were deepened by glacial action on former river valleys. Elevations of more than 300 feet occur on Fyn in the southeast and west, on Sjaelland in the south central area, and on most of the northern two-thirds of Bornholm.



Location Map of Denmark

Coasts. Denmark has about 4622 miles of coast and 42 miles of land frontier. The even North Sea shore line of Jutland is the most inaccessible and lacks natural harbors. The important harbor at Esbjerg is manmade. Broad beaches, sand dunes, and cliffs dominate the shore. In the south some of the cliffs and dunes have been submerged and appear as islands, separated from the shore by channels that are dry at low tide. Limestone cliffs at Bulbjerg attain a height of 153 feet; chalk cliffs at Hanstholm are 220 feet above the sea; and clay cliffs at Bovbjerg are 186 feet high. The other coasts of Jutland have many bays and inlets with dunes and sandy beaches that adjoin wooded hills and rolling meadows. Although the coasts of the islands resemble the eastern coast of Jutland, the northern coasts of Bornholm are rocky and the eastern coast of Möen is marked by a chalk cliff, Möens Klint, reaching 469 feet. The principal straits are Little Belt, between Jutland and Fyn; Great Belt, between Fyn and Sjaelland; and Øresund, between Sjaelland and Sweden.

Rivers, Fiords and Lakes. Because of the physical configuration of Denmark there are only a few significant rivers. The most important is the Gudenaa, which rises in east central Denmark about 15 miles west of Horsens and flows northeast 98 miles to Randers, where it enters Randers Fjord. Other principal rivers include the Omme and the Skjern, which flow west into the Ringkøbing Fjord in east central Jutland. Lim Fjord, cutting across the northern part of Jutland from the Kattegat to the North Sea, is the most extensive in Denmark. Other fiords include the Nissum in western Jutland and the Mariager, the Horsens, the Veile, the Kolding, the Aabenraa, and the Flensborg in the east. The Odense and the Nyborg are on the island of Fyn. On the island of Sjaelland the most prominent fiords are the Ise, the Roskilde, the Kalundborg, and the Avnø.

DANISH INFORMATION OFFICE

Fisherman of Jutland

PHILIP GENDREAU

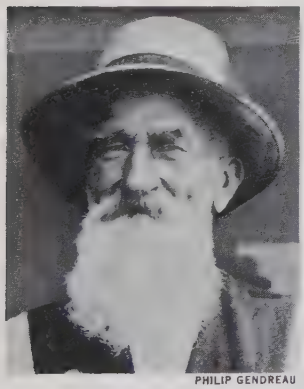
Fresh catches are sold daily at the fish market in Copenhagen.

DANISH NATL. TRAVEL OFFICE

Danish Secretary

DANISH NATL. TRAVEL OFFICE

Bicycles are a common means of transportation for all ages.



PHILIP GENDREAU

Danish Farmer

DANISH NATL. TRAVEL OFFICE

Harvest time brings bountiful crops from the rich farm lands.

DANISH NATL. TRAVEL OFFICE

Pottery Craftsman

DANISH INFORMATION OFFICE

This plant makes the renowned Royal Danish porcelain.

DANISH CONSULATE GENERAL

One of Denmark's oldest dormitories for college students is the *Regensen*, founded by Christian IV. At rear is the *Rundetaarn*, built as an observatory by Christian in 1642.

There are many glacial lakes, especially in east central Jutland. Total lake surface area is about 215 square miles.

Climate, Soils, and Natural Vegetation. Denmark has a Marine West Coast climate. Because of its size and the fact that no point is distant from the sea, Denmark is more temperate than its latitude suggests. The mean annual temperature is 45°F; summer temperatures average about 59° and winter, about 32°. The average annual precipitation, predominantly rain, is 24 inches. Though the wind direction changes frequently, it is generally from the west and southwest. Calm weather for more than a day or two is rare.

The soils of eastern Jutland and the islands are loamy and the most productive. Those of western Jutland are sandy and relatively poor. Since 1900 about half the formerly unproductive heath and dune area, mainly in the west, has been cultivated or planted in conifers. Scattered areas of beech, with pine and birch on Bornholm, bring the wooded part of Denmark to less than 10 per cent of the total land area. Other natural vegetation includes the typical low shrubs of the heaths and dunes. There are no large animals other than a few deer in the parks.

Social Factors

Population. The population of Denmark in 1950 was 4,281,275, more than half of it on the islands which form about 30 per cent of the total area. More than half of the total population is rural. Of the 2,055,000 gainfully employed, approximately 700,000 were in agriculture, fishing, and related industries; 705,000, in industry, handicrafts, or construction; 430,000, in commerce and transportation; and about 200,000, in professional and administrative positions.

PRINCIPAL CITIES

	POPULATION	
	1945 Census	1950 Census
Copenhagen (capital)	927,404	974,901
Aarhus	107,393	116,167
Odense	92,436	100,940
Aalborg	60,880	79,806
Esbjerg	43,241	48,205
Randers	36,434	40,098
Horsens	32,400	35,898
Kolding	27,660	31,017

Religion. The established church in Denmark is the Lutheran church although freedom of religion is extended to others. In the established church each parish elects a congregational council, which administers the church property and influences the choice of clergy. The bishop of Roskilde is the primate of Denmark. There are nine bishoprics with their attendant bishops and deans who supervise the parish clergy. Catholics, Jews, Methodists, Reformists, Baptists, and Irvingites numbered 70,000 in 1950.

Education and Public Welfare. Since 1814 education has been compulsory for children between the ages of 7 and 14. A four or five year course is offered in the primary school system. The children then enter the intermediary school, where there is a choice of academic or pre-vocational courses. At 15 children may try for entrance into a one year Real Class, which prepares them for the examination to enter civil service apprenticeship, a commercial high school, or certain professional schools; they may also compete for entrance into the three year Gymnasium, the equivalent of senior high school, and the first two years of college, which prepares them for university or the engineering college, where courses are on the professional level. There are two universities, one at Copenhagen, founded in 1479, and one at Aarhus, 1928. Copenhagen also has a technical, a veterinary, and an agricultural college. Since 1942 there have been special schools for unskilled workers between the ages of 14 and 18. The evening school act, passed in 1930 and revised in 1935, 1942, and 1948, offers evening study groups for adults. The Folk Schools, another branch of adult education, are all private schools, first established in 1844. The majority of the students are from 18 to 25 years old, men attending a five month winter session and the women a three month summer session.

Social legislation in Denmark includes workmen's compensation and unemployment insurance. Since 1891 a program for the retirement of men at age 65 and women at 60 has been offered, provided the person's income and capital are limited. Three-week vacations with pay for every full year of employment are guaranteed every wage earner by law. A national health insurance program is participated in by about 70 per cent of the population. The Home Help Service Act of 1949 provides help in the homes of the sick or convalescent on a free basis or according to family income. Free milk is given to needy expectant mothers for a period of six months before and after confinement. There are family allowances to the needy for the support of their children. Local government commissions administer child welfare programs; there are no juvenile courts in Denmark.

Economic Factors

Agriculture. The cool, moist summers and mild winters of Denmark are particularly adaptable to raising cattle and forage crops. The area devoted to agricultural production totals about 12,000 square miles, or about three quarters of the total land area. There were 210,000 farms in Denmark in 1950, averaging about 37 acres in size. Since there are many small holdings the typical farm is closer to 60 acres in size. Chiefly a grain producer and exporter until the 1880s, Denmark since then has developed its animal husbandry and the marketing and processing of agricultural products through the highly efficient co-operatives. (See Co-operative.) There were about 1300 of these organizations in Denmark in 1955. Domestic animals in 1954 numbered 25,234,000 poultry, 4,840,000 hogs, 3,123,000 cattle, 33,000 sheep and lambs, and 358,000 horses. Total crop production in tons for 1954 was: barley, 2,035,000;

DENMARK

Copenhagen's Kongens Nytorv (King's New Square) is noted for sidewalk cafes. In the center is the statue of Christian V.
DANISH NATL. TRAVEL OFFICE

Welcoming world tourists to the port of Copenhagen is *The Little Mermaid* statue, illustrating a fairy tale by Andersen.
DANISH NATL. TRAVEL OFFICE

One of Copenhagen's brightest spots is the Tivoli, an amusement park. The fairy palace, center, is used as a music hall.
DANISH NATL. TRAVEL OFFICE

These women of Gudhjem, on the island of Bornholm, dry herring in the sun to prepare it for the smoking houses, left.
DANISH NATL. TRAVEL OFFICE

Jutland women in Danish national costumes join in a coffee hour. Such dress has generally gone out of use among women of Denmark today.
DANISH NATL. TRAVEL OFFICE

DANISH INFORMATION OFFICE

A Danish craftsman engaged in blowing glass by hand, a method that is somewhat obsolete except for the most delicate pieces. Denmark is famed for its handsome glassware.

oats, 787,000; mixed grains, 781,000; rye, 280,000; wheat, 279,000; root crops, 20,852,000; and potatoes, 1,963,000. Denmark has one of the highest per-acre crop yields in the world. The chief agricultural exports are butter, eggs, bacon, and condensed milk. Large amounts of stock feed, fodder, and fertilizer are imported. In 1955 dairy products amounted to 18 per cent of the total value of exports and 31 per cent of the total value of all agricultural products exported. About 69 per cent of all the butter exported went to the United Kingdom. Of the cheese exported 40 per cent went to West Germany and 21 per cent to the United Kingdom.

Fisheries and Mining. The North Sea is the source of about one-half of the total value of the Danish fisheries. It is especially good for haddock and large size cod. The Little Belt and the Great Belt and the Baltic Sea yield larger amounts of cod. Herring is the chief catch in the Belts, The Sound, and the southern Kattegat. Other important fish of commercial value are flounder and eel. The wealth of the fishing industry fluctuates somewhat; total production was valued at $22.6 million in 1950 and $32.6 million in 1954. About 23 per cent of the catch exported in 1954 went to the United Kingdom, 12 per cent to West Germany, and 7 per cent to the United States.

The mineral resources of Denmark are of very little importance. Kaolin and granite are mined on the island of Bornholm; peat and lignite in southern Jutland; and limestone and chalk are quarried for cement.

Commerce and Industry. The industrial output of Denmark increased about 42 per cent during the period from 1947 to 1951. The ten leading industries according to value of production in 1953 were: food, $305 million; chemicals, $151 million; textiles, $149 million; engine works, including iron foundries, $139 million; transportation equipment, $133 million; footwear and clothing, $130 million; electrical machinery and associated goods, $90 million; stone, clay, and glass, $82 million; metal products, $77 million; and printing and publishing, $72 million. Important individual products in order of their importance were; meats, machinery, clothing, textiles, ships, sugar, hosiery, iron and steel goods, beer, metal goods, margarine, confectionery, wheat flour, paper cardboard, and leather footwear. Glass, porcelain, and diesel engines are also important.

The total value of Denmark's imports in 1954 was about $1,162,900,000, and the value of exports was $949,200,000. Fuels and lubricants made up 17 per cent of the total value of the imports for the period 1952–54; metals and metal products, 12 per cent; textile fibers, yarns, and fabrics, 11; machinery, 8; transportation equipment, 8; animal feed, 5; wood products and pulp, 4; and fertilizers, 4. Live animals and meat made up 32 per cent of the total value of exports; dairy products, eggs, and honey, 28; machinery, 10; fish and fish products, 3; and cereals and cereal preparations, 3. Denmark's principal trading partners in 1954 imports by per cent of total value were the United Kingdom, 34; Germany, 26; Sweden 12; Belgium, 6; United States, 6; and France, 6. Principal receivers of exports were the United Kingdom, 48 per cent; Germany, 20; United States, 10; Sweden, 9; and Norway, 5.

The National Bank of Denmark, a private institution under government control, has the sole right of note issue and is the center of the financial system.

Denmark has many notable and historic points of interest that contribute to the importance in the national economy of catering to tourists. The Kronborg Castle at Helsingør (Elsinore) was immortalized in Shakespeare's *Hamlet*. Rosenborg Castle, Copenhagen, built 1606–17, houses many of the royal treasures. The Museum of National History is in the castle at Frederiksborg. The ruins of Hammershus Castle, built in the thirteenth century, are on Bornholm. Among Denmark's notable churches is the cathedral of Roskilde, 1219–1464, called the Westminster Abbey of Denmark. Rebild National Park, 450 acres located 15 miles south of Aalborg, was donated to the government by Danish-born Americans provided that the U.S. Independence Day be celebrated there annually. Hans Christian Andersen Museum is at Odense. A tenth century rune stone at Jelling attracts much interest (see RUNE).

Transportation and Communications. A dense highway and rail network is supplemented by coastal shipping. There were 5149 miles of major roads and 28,252 miles of secondary roads in Denmark in 1954. The total number of miles of railroad in operation in 1953 was 2981; of this 1652 miles were government owned. Railway bridges connect the peninsula of Jutland with the islands of Als and Fyn and the islands of Falster, Lolland, and Möen with the island of Sjaelland. There are rail ferries from Als to Fyn, Fyn to Sjaelland, and Sjaelland to Sweden. Copenhagen, the largest port, operates as a free port under the administration of a private company controlled by the government. Government owned ports are at Anholt, Helsingør, Esbjerg, Frederikshavn, Hammerhavn, Skagen, and Thyborøn. Of the more than 80 seaports, Copenhagen, Aarhus, Esbjerg, and Aalborg are the most important. Copenhagen is the center for air transportation.

Interprovincial telephone service and postal and telegraph services are operated by the government. All radio and television broadcasts are made by the national broadcasting system to subscribers; there is no advertising.

ADMINISTRATIVE FACTORS

Government. The constitutional monarchy of Denmark is governed under the *Grundlov* or charter of June 5, 1953. The executive power is vested in the

monarch, who exercises it through a cabinet of 14 ministers who are required to have the confidence and support of the *Folketing* (parliament). The legislative power lies jointly between the monarch and the parliament. The king may declare war or sign a peace treaty, however, without parliament's consent. Parliament has 179 members. Of these 139 are elected by proportional representation from 23 districts; 40 are divided among parties that do not receive sufficient returns in their districts; 2 are elected from Greenland and 2 from the Faeroe Islands. The term of the legislature is four years but it may be dissolved by the monarch at any time. All Danish citizens over 23 years of age have the right to vote. For administrative purposes Denmark is divided into 22 amters (counties), each having a governor and a council, with a separate district for Copenhagen.

Judiciary and Armed Forces. The judicial system consists of a supreme court with 15 judges; two superior courts, one at Copenhagen with 25 judges, one at Viborg with 17 judges; and 94 lower tribunals.

All able-bodied men between the ages of 18 and 25 are subject to 16 months' military, naval, or air force training. The total active manpower in the armed forces in 1955 was 41,000. There were 150,000 reserves. The navy had six major ships and the air force had 125 military planes. W. D.

History

Archaeology and Early History. Excavations have uncovered evidences, especially in kitchen middens and barrows, of Stone Age people in what is now Denmark before 2000 B.C. There are also remains of the Bronze Age Beaker people with traces of contacts reaching into southern Europe. The Danes are first mentioned, as a people on the edge of civilization, in Roman records and histories. Their first serious impact on the history of Europe was a series of wars with Charlemagne. A settlement was negotiated in 811 that halted Frankish expansion at the Eider River, long regarded as the Danish southern boundary. During the ninth and tenth centuries the Danes, along with other warrior bands from Scandinavia, attacked and sometimes settled in England, Ireland, and the coasts of Europe. (See Viking.) In 826, King Harold was converted to Christianity, and shortly afterward St. Ansgar began the work of preaching and conversion, which over the next several centuries succeeded in establishing Christianity in Denmark.

The kingdom was united under Gorm and his son Harold Bluetooth in the tenth century. In the century following, under Sweyn and especially under his son Canute the Great, Denmark was the center of an empire including most of Scandinavia and England. Although the empire dissolved soon after Canute's death, the contacts with England and the rest of Europe greatly influenced Danish culture. See Canute.

Medieval Denmark. The Danish monarchy was theoretically elective, though a member of the royal family was ordinarily chosen king and force was frequently the deciding factor. The aristocratic class, composed largely of warriors gradually changing from tribal chieftains to feudal lords, was dominant. The church was a force for unity, for integration into European civilization, and often for restraint on the warrior nobles. With its aid, Waldemar I (1157–82) built a more strongly unified monarchy and defended the southern frontier from the Slavs. Under his successors, towns were built and the royal court and administration were expanded.

Externally, Denmark was in conflict with other Scandinavian powers and with the Slavs and Germans to the south. The German emperors several times claimed feudal suzerainty over the Danish kings, but usually their power was only nominal. Waldemar II (1202–41) made his kingdom a foremost power of northern Europe, with holdings on the southern shore of the Baltic and considerable control over the growing trade. Some of the conquests were lost, 1226–27, and the power of Denmark was weakened during the century following, partly through contention with the dukes of Schleswig, a younger line of the royal family.

Waldemar IV, called Atterdag (1340–75), restored the prestige and power of the monarchy. By the

DANISH CONSULATE GENERAL

The Cathedral of Roskilde, Burial Place of Danish Kings Since Harold Bluetooth, 985

charter of Kallundborg, 1360, he established the legal rights of king, clergy, and estates. His attack on Wisby (Visby) in 1361, however, involved Denmark in war with the Hanseatic states, ending in the treaty of Stralsund, 1370, to the disadvantage of Denmark. (See HANSEATIC LEAGUE.) Waldemar's daughter Margaret was married to Haakon VI of Norway. After the deaths of Waldemar and Haakon she held the kingdoms of Denmark and Norway as regent, first for her son Olaf and after his death for her grandnephew Eric. Her armies drove out those supporting the claimant to the Swedish throne and by the Union of Kalmar, 1397, the three Scandinavian kingdoms were united under a single king, each retaining its own laws and customs. As Swedish national sentiment grew more powerful, the union was weakened and was ultimately broken in the early sixteenth century. The union of Denmark and Norway lasted until 1814.

The nobles and especially the Council of State, composed of leading nobles and churchmen, remained the most powerful group, though there were some signs of increasing royal strength. Towns and commercial classes grew stronger under Eric of Pomerania (1389–1439) and his successors, especially Christian I (1448–81), the founder of the Oldenburg line. One source of later trouble developed with the union in 1460 of Schleswig and Holstein and their status as united to Denmark through the person of the king rather than as integral parts of the kingdom.

Reformation and Wars. Protestantism, early introduced into Denmark by Lutheran preachers, had a measure of sympathy from Frederick I (1523–34) and support from his successor Christian III (1534–59). The conflict with Catholicism, however, was intertwined with the conflict between king and nobles and with the effort of Christian II, deposed by the nobles in 1523, to regain the throne. Christian III triumphed and in 1536 made Lutheranism the official religion of Denmark. One effect was to strengthen the nobles, both by adding church property to their wealth and by removing an important opposing force.

Copenhagen's Christiansborg Palace houses Parliament, the Foreign Office, and royal reception rooms. At left is the Stock Exchange; in foreground boats from Danish islands.
DANISH NATL. TRAVEL OFFICE

Frederick II (1559–88) and his son Christian IV (1588–1648) in their efforts to make Denmark the dominant power of the Baltic came into unsuccessful conflict with Sweden from 1563 to 1570 and from 1611 to 1613. Christian IV also engaged in the Thirty Years' War, partly out of support for the Protestant cause and partly out of interest in German affairs, but certainly to forestall the growing power of Gustavus Adolphus of Sweden. (See THIRTY YEARS' WAR.) Failure in the war meant a withdrawal by Denmark from German affairs, but the struggle with Sweden was renewed in 1643–45 and again in 1648–70, with a loss of territory and a weakened position resulting for Denmark.

Absolutism. One result of the wars and of the changes taking place in Denmark and Europe, however, was the strengthening of the monarchy. In 1660, over the opposition of the council, the other estates granted the king an absolute and hereditary monarchy in place of the limited elective kingship Denmark had known since the Middle Ages.

A succession of leading ministers, Peder Schumacher (Count Griffenfeld), Schulin, and the Bernstorffs (see BERNSTORFF, JOHANN HARTWIG ERNST, COUNT VON) guided the Danish absolute monarchy in the late seventeenth and the eighteenth centuries. The war with Sweden was renewed, 1675–79, with successes for the Danish fleet but no substantial gains for Denmark because of the intervention of France. In 1699–1700 and 1709–20, Denmark joined in the coalition against Charles XII of Sweden (see CHARLES XII) but the only territorial gain for Denmark was the Gottorp portion of Holstein.

For the rest of the century, Denmark attempted, under conditions of peaceful neutrality, to develop trade and industry. The commerce of the Baltic was increased, the possessions in the Danish West Indies were expanded, and Danish shipping was promoted in the Mediterranean and on the Atlantic. Danish agriculture and shipping and the West Indian islands all profited from Danish neutrality in the wars between England and France, 1756–63 and 1778–83.

In 1770, Count Struensee (see STRUENSEE, JOHANN FRIEDRICH, COUNT) became chief minister and attempted a series of radical reforms along the lines of enlightened despotism of the age. In a violent reaction, partly personal and partly political, he was overthrown and beheaded. Under the leadership of the crown prince, who later became Frederick VI (1808–39), and of Andreas Peter Bernstorff a number of reforms were achieved. The most important was the abolition of serfdom in 1788. Measures were passed for the preservation of small peasant holdings; the gradual lessening of mercantilism and monopoly; and, in the early nineteenth century, relaxation of censorship and the legal introduction of compulsory education.

The Napoleonic Era. Though these measures represented in part the impact on Denmark of the currents of thought that led to the French Revolution, that upheaval itself was not imitated in Denmark. When war broke out between France and the various coalitions of Europe, Denmark attempted to continue its policy of neutrality. In defense of commercial interests, and in part in dependence on Russia, Denmark joined the Armed Neutrality of the North in 1800. The next year, the English government, regarding such neutrality in effect as support for Napoleon, sent the fleet into the Baltic. Copenhagen was bombarded by Admiral Horatio Nelson, Apr. 2, 1801, and Denmark submitted to British search of its vessels. Continuing conflict over Danish neutrality, especially Denmark's refusal to join in the third coalition against Napoleon, 1805, led to another British bombardment of Copenhagen, Sept. 2–4, 1807, and the seizure of the Danish fleet. The Danes reluctantly allied themselves to Napoleon, and after heavy losses in their trade and merchant fleet during the war, lost Norway to Sweden in the peace settle-

ment of 1814. Iceland and Greenland remained in Danish possession.

Constitutionalism. The general currents of liberalism and constitutionalism that affected Europe in the nineteenth century reached Denmark. Provincial assemblies were formed according to laws of 1831 and 1834, but King Christian VIII (1839–48) refused to yield to requests for a constitution to replace the written grant of absolute monarchy in 1660. His successor, Frederick VII (1848–63), accepted the *Grundlov* drafted by an assembly of all three estates on June 5, 1849. This created a bicameral legislature, to which the government in future was to be responsible, and made Denmark a limited and constitutional monarchy.

One reason for the king's acceptance of the constitutional demands was the external difficulties of Denmark. Rising nationalism in Denmark demanded the unification of Schleswig and Holstein with the Danish state, and a greater use of the Danish language. At the same time, the nationalism of the German-speaking population in Holstein and parts of Schleswig led them to oppose any such Danish nationalism. The German Confederation, especially the kingdom of Prussia, supported Schleswig-Holstein, but in a brief war, 1848–50, the Danes won over the local armies and absorbed the duchies into the Danish kingdom. On the accession of Christian IX, in 1863, a new conflict broke out over the position of Schleswig-Holstein. Prussia, rising to military pre-eminence, defeated Denmark, and the settlement placed the duchies under the joint administration of Prussia and Austria. See also SCHLESWIG-HOLSTEIN.

Social Developments. Reduced in size and committed for the succeeding period to a policy of neutrality, Denmark concentrated upon economic and social development. Under the leadership of men like Bishop Grundtvig (see GRUNDTVIG, NICOLAI FREDERIK SEVERIN), the educational principles of the folk schools were developed. The small farmers of Denmark were organized in the co-operative movement. Improvement in agricultural methods and the demand for Danish produce abroad marked important trends in the economy.

The nineteenth century was notable in Danish literature for figures like Georg Brandes, the critic, Sören Kierkegaard, the religious philosopher, and for the unique genius of Hans Christian Andersen. See DANISH LANGUAGE AND LITERATURE.

World War I and After. During World War I Denmark, along with Sweden and Norway, maintained neutrality. British control of the North Sea and the interpretation of the rules of neutrality brought diplomatic conflicts and seriously curtailed Danish commerce.

The Danish constitution was amended in 1915 to widen the suffrage for both houses of the parliament by abolishing the property qualification and granting women the right to vote. After several unsuccessful efforts in the nineteenth century, arrangements were finally completed in 1916 for the purchase of the Danish West Indies by the United States (see VIRGIN ISLANDS).

The Treaty of Versailles after World War I provided for a plebiscite to determine whether the northern district of Schleswig-Holstein, known to the Danes as southern Jutland, would go to Denmark or to Germany. The plebiscite, held in 1920, returned the territory to Denmark. Denmark joined the League of Nations in 1920. In the years following World War I, the development of consumer co-operation and of government aids and controls made Denmark one example of the welfare state.

World War II. Although Denmark, which had signed a nonaggression pact with Germany in 1939, declared its neutrality, German troops invaded Denmark on Apr. 9, 1940, in such force that resistance was scattered and ineffective. German hopes and efforts were that Denmark could be administered as a model protectorate and that the Danes would be won over. Elections in 1943 went against the parties favoring the Nazis; there were riots and strikes; and government and people alike made clear their antagonism to the occupation and their lack of sympathy for Nazi objectives. The Germans arrested the cabinet, interned King Christian X, and put the country under the control of a German general governing by martial law. Denmark was liberated in May 1945.

SWEDISH AMERICAN LINE

Frederiksborg Castle is a historical museum at Hillerød northwest of Copenhagen. It was built by Christian IV in the seventeenth century on three islands in a small lake.

While Denmark was in occupation, its possessions in Iceland and Greenland, strategically important as weather stations and bases for transatlantic aircraft, were occupied by United States forces. Iceland since 1918 had had an independent government linked to Denmark only through the person of the king. In 1944, it declared itself an independent republic and was so accepted by Denmark after the war. Greenland was returned to Danish authority in 1946, although United States bases remained.

Postwar. The re-established Danish government became a charter member of the United Nations. After unsuccessful attempts to organize a Scandinavian defense system, Denmark joined the North Atlantic Treaty Organization (see ATLANTIC PACT) in 1949 and was a member of the Council of Europe and of an Anglo-Scandinavian financial union. Aid from the United States strengthened the defenses and the economy of Denmark.

Frederick IX succeeded to the throne on the death of his father Christian X in 1947. In 1953 a new constitution was adopted creating a single legislative house, the *Folketing*, and providing for female succession to the throne. The *Folketing* gave representation to the Faeroe Islands, which maintained an assembly of their own, and to Greenland. There was a strong movement in the Faeroe Islands for independence. Renewed difficulties over the Danish group in German Schleswig-Holstein and the German-speaking population on the Danish side of the border led to an agreement in 1955 between Denmark and the West German Republic providing for protection of both minorities. See also NORWAY, History; SWEDEN, History; GREENLAND; ICELAND; FAEROE ISLANDS; COPENHAGEN; HELSINGØR; BORNHOLM; CO-OPERATIVE; RUNE.

G. J. F.

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DENMARK, town, S central South Carolina, Bamberg County, on the Atlantic Coast Line, the Seaboard Air Line, and the Southern railroads and U.S. highways 78 and 321; 36 miles ESE of Aiken. Lumber products, plywood and veneer, are manufactured. Pop. (1953 special census) 3542.

DENMARK STRAIT, sea passage, lying between Greenland on the W and Iceland on the E; about 300 miles long and 200 miles wide. The strait has a southward flowing current from the Greenland Sea. During World War II the German battleship *Bismarck* sank the British battle cruiser *Hood* here in May 1941.

DENNEWITZ, village, Germany, in the East German district of Potsdam; 40 miles SW of Berlin. Dennewitz is the site of a battle fought Sept. 6, 1813. To save Berlin, an army of 50,000 Prussians under Bülow, in a day-long battle, staved off a numerically superior French army (58,000 French and Polish troops) under Marshal Michel Ney; the arrival of Swedish and Russian reinforcements turned the tide against the French.

DENNISON, WILLIAM, 1805–82, U.S. public official, was born in Cincinnati, Ohio. He was graduated from Miami University (Oxford, Ohio) in 1835, became a lawyer, and served in the Ohio legislature, 1848–50, and as governor of the state, 1860–62. He strongly supported the raising of a Union army, was appointed postmaster general by President Lincoln in 1864 and continued under President Johnson until 1866, when he resigned after a quarrel with the president. He was an important promoter of railroad enterprises.

DENNISON, village, E central Ohio, Tuscarawas County, on Stillwater Creek, the Pennsylvania Railroad, and U.S. highways 36 and 250; 28 miles S of Canton. Dennison manufactures sewer pipe, sheet metal products, and chinaware. Pop. (1950) 4432.

DENSITY, the mass per unit volume of a particular substance. In the metric system of measurement (see METRIC SYSTEM) the density of solids and liquids is usually expressed as grams per cubic centimeter whereas the density of gases is expressed as grams per liter. The English system of measure generally states the density of solids, liquids, and gases in terms of pounds per cubic foot. For practical purposes mass and weight are interchangeable; thus the relationship between density D, weight W, and volume V can be expressed as $D = W/V$, which indicates that it is necessary to know the weight and volume of the substance in order to calculate its density. For example, given a 100-gram sample of aluminum with a volume of 37 cubic centimeters, it is only necessary to divide the weight of the metal by its volume to obtain the density of aluminum—2.699 grams per cubic centimeter. The density of liquids and gases may be determined in a similar manner.

The volume of a solid, liquid, and gas is dependent upon its temperature; therefore it is important that the temperature be stated along with the density. For example, at 4°C water has a density of 1 gram per cubic centimeter, but at 95°C its density is only .96 gram per cubic centimeter. Although pressure has little effect upon the volume of solids and liquids, a small change in pressure will have a pronounced effect on the volume of a gas; hence in stating the density of a gas it is important that both the pressure and temperature be given. Tables of density data indicate the temperature and pressure at which the measurements were made, usually 0°C and 760 mm of pressure in the metric system, and 32°F and one atmosphere of pressure in the English system.

The element osmium has the greatest density of any known substance; its density at 0°C is 22.5 grams per cubic centimeter or 1404.3 pounds per cubic foot. Hydrogen gas, the least dense substance has a density of .089 gram per liter or .0056 pound per cubic foot at 0°C and 760 mm of pressure. See SPECIFIC GRAVITY; HYDROMETER; GAS.

DENTAL ASSOCIATION, AMERICAN. See AMERICAN DENTAL ASSOCIATION; DENTISTRY.

DENTAL CARIES. See TEETH, Tooth Decay; CARIES.

DENTAL HYGIENE, often called oral or mouth hygiene, deals with the preservation of health of the mouth and teeth. Concerned with keeping the teeth and gums in healthy condition, dental hygiene includes preventive care by the individual and by the dentist. Healthy teeth and gums afford valuable protection against many diseases.

History. Although dental hygiene is commonly thought of as a newly developed science, it was a subject of concern in early times. In the eighth century Arabian physicians expressed interest in dental therapeutics. Abucalsis wrote on the care and treatment of the teeth, and Avicenna warned against using gritty dentifrices. An early reference to dental hygiene in the United States appears in the records of the annual meeting of the American Dental Association in 1870, when a resolution was passed for the establishment of "a committee to correspond with the publishers of American schoolbooks and request them to insert information on dental hygiene in public school texts."

Good Habits. Dental health affects general health throughout life. One of the best means of protecting the teeth is by the early establishment of proper habits. Children should be introduced to the ritual of brushing their teeth at about the age of two years by having them go through imitative motions. Although efforts will be clumsy and ineffectual at first, the habit of toothbrushing will thus become established.

At about this same age, or when the 20 primary (first) teeth have erupted, the child should make his first visit to the dentist. Although little or no dental treatment is necessary at this age, the dentist has this opportunity to gain the child's confidence and stimulate his curiosity. In this way the child should have no fear and may look forward to his first dental treatment in good spirits. Dental prophylaxis is an important part of mouth hygiene for both children and adults. It consists of the removal of all foreign material that may irritate the gums and cause infection or damage and the smoothing and polishing of tooth surfaces.

Harmful Habits. Sometimes the teeth are used in the performance of various types of work, and defects in the teeth are produced. For example, the biting of thread may produce one or more small notches in the edge of both the upper and lower front teeth. Nails, which frequently are held between the teeth by shoemakers and upholsterers, cause indentations in the cutting edge of the teeth or wear off the corners. Similar destructive results are produced by lead pencils, needles, and pins. A particularly damaging habit is the opening of bobby pins with the teeth. Pipe smoking causes typical abrasions and regular notches, called pipe holes, may become worn in the teeth to accommodate the pipe stem. Sucking habits, biting

DR. W. W. COGSWELL

Close-up of Typical Bobby-Pin Notches in Front Teeth

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Most dentists recommend the tooth-brushing method illustrated in these four photographs. Left, the inside surface of back teeth is brushed by firmly rolling the bristles of the brush over the surface of the teeth toward the chewing surface. In the second view the inside surface of the upper front teeth is brushed by drawing the bristles downward over the teeth toward the biting edges. In the third, the inside surface of the lower front teeth is brushed by drawing the bristles upward and forward over the teeth toward the biting edges. At the right, the chewing surfaces are brushed by forcing the bristles into the grooves, while vibrating the brush backward, forward, and sideways.

habits, and improper posture during the waking hours may exert pressures that interfere with a good growth pattern. Some dental authorities believe that a sleeping posture that produces prolonged pressure on the jaws may be harmful. Malocclusion, or irregularities of tooth position, may be inherited or acquired. However, the nature of malocclusion is so complex that it is seldom possible to attribute the condition to one cause in the individual case.

Brushing the Teeth. Brushing of the teeth after meals helps to eliminate particles of food and consequently aids in control of tooth decay. (See CARIES.) Proper brushing also appears to help maintain healthy gum tissues. The family dentist will recommend the best type of brush and the best method of brushing. In general, however, a good toothbrush should have a flat brushing surface, firm bristles, and a small head. It should be kept clean and should be placed where it will dry quickly and not come in contact with another brush. To be most effective, brushing should be thorough, reaching each accessible surface of every tooth is necessary. Brushing the teeth, in addition to removing food debris from between the teeth or from the fissures of the biting surfaces, stimulates blood circulation in the gums and prevents calculous (tartar) deposits. In general, a few simple rules should be followed: brush the teeth after eating—each area at least five times, brush the lower teeth with upward strokes and the upper teeth with downward strokes, brush the chewing surfaces with a scrubbing stroke, the surfaces next to the tongue as well as those next to the cheek, and brush the teeth of each jaw separately in a definite order.

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Developing the Toothbrush Habit

Dentifrices. A dentifrice, tooth paste or powder, should be used to aid the brush in cleansing the accessible surfaces of the teeth, for mouth hygiene or for special treatment. The dentist will give advice concerning an acceptable dentifrice. However, an effective, inexpensive dentifrice can be made by mixing one part of powdered table salt with two parts of baking soda. Certain studies indicate that dentifrices containing substances such as ammonium or fluoride may reduce the occurrence of dental caries, but the effectiveness of such preparations has not been definitely established. Most dentifrices contain abrasives such as calcium and sodium compounds to prevent residual stains on the teeth.

Mouthwashes. Despite belief that complete mouth hygiene cannot be achieved without the use of a medicated mouthwash, for most persons the use of drinking water as a mouth rinse will serve the same purpose. Pleasantly flavored mouthwashes frequently are used as mouth deodorants, but their effects are temporary. It is unwise, if not dangerous, to use a medicated mouthwash without the advice of a dentist because a mouthwash alone will not cure a disease or correct a defect and may produce irritation.

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Thumb Sucking, a Harmful Habit

Diet and Nutrition. From time to time theories have been proposed regarding the relationship between diet and dental health; available information indicates that diet may affect the structure of the teeth during the period of tooth development.

Mineral content of the teeth may increase slightly during a lifetime. The calcium content of the enamel does not change a great deal after the tooth has erupted. Although the teeth are not subject to calcium withdrawal, the supporting bone is; therefore the addition of calcium to a well-balanced diet is not essential. The same is true of phosphorus. The use of vitamins and minerals in amounts in excess of those required for a balanced diet has not been shown to have any favorable relationship to good dental health. Vitamin D is of value in the formation of hard dental structures, including the teeth themselves. It does not aid in the maintenance of the fully formed teeth or in the prevention or retardation of tooth decay, but an adequate amount is necessary to maintain the supporting tissues. However, vitamin D

may have to be added to the diet in amounts recommended by a physician or dentist if an adequate supply is not naturally available from sunlight or food.

The nutritious benefits of fresh fruits and vegetables long have been recognized. Aside from supplying vitamins and other food factors, fresh fruits and vegetables perform an important mechanical cleansing function. When an apple or a similar fruit is eaten for dessert, sticky foods are cleared away to a great extent, and the mouth and teeth feel clean. Menus conducive to dental and general health can be based on the following list: milk and milk products, meat, fish or poultry, eggs, butter or fortified margarine, vegetables and fruits, and bread and cereals. See DEFICIENCY DISEASE; TEETH.

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DENT DU MIDI, mountain in the western Alps, SW Switzerland, Valais Canton, near the French border, 39 miles ESE of Geneva and 18 miles S of Montreux, in the lower valley of the Rhône River; altitude, 10,695 feet.

DENTINE. See TEETH.

DENTISTRY, a profession of the healing arts specializing in the prevention, diagnosis, and treatment of diseases and disorders of the teeth, gums, jaws, and associated parts, and the repair and replacement of injured or missing teeth. The practice of dentistry is regulated by law; in the United States only those who have qualified by four years of study in an approved dental school and have passed an examination for a state dental license may practice as professional dentists.

Dentistry is both a science and an art. The diagnosis and treatment of dental ills is based on knowledge of the biological sciences; the restoration and replacement of teeth requires training in the physical sciences. The operations necessary in dental service require unusual technical skill and precision and a keen sense of harmony and aesthetics. Dentistry developed from a mechanical trade, but after the first dental school was founded in 1840 the profession made rapid advances, especially in the United States and Canada. Although dentistry is a major profession of the healing arts and co-operates with similar professions in raising the level of the public health, it is independent in the United States and Canada and maintains its own program of education, societies and scientific literature. In some parts of the world, especially in Europe, dentistry is more closely associated with and more dependent upon medicine and in general has not advanced so rapidly in professional skill or achieved the high professional standing and public approval medicine enjoys.

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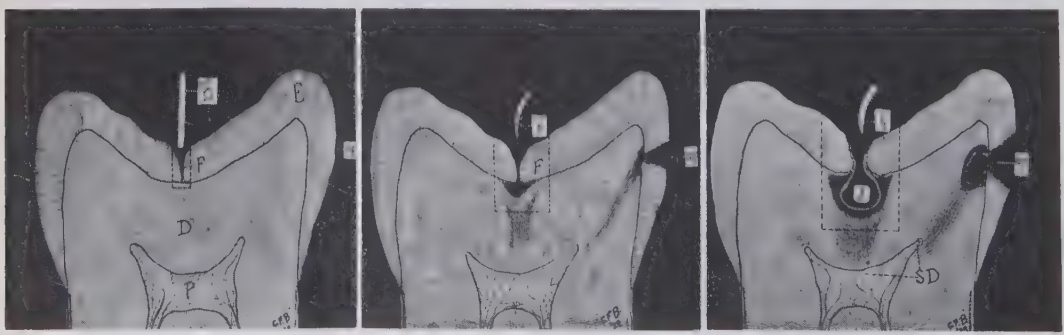
Compact arrangement of equipment characterizes the modern dental office. Fountain and drilling equipment are located at left, X ray and storage chest conveniently at right.

HISTORY

Dentistry dates back to the earliest periods of recorded history. Egyptian physicians specialized in diseases of the teeth and relieved toothache, pulled defective teeth, and treated the gums and jaws. The first replacements of lost teeth with artificial substitutes were probably made by the ancient Phoenicians. The Greeks and Romans also practiced dentistry and made distinct contributions to the art of tooth replacement. About 400 B.C. Hippocrates (see HIPPOCRATES), the father of medicine, wrote about diseases of the teeth and jaws. Aristotle (see ARISTOTLE) was the first to describe a blood supply to the teeth. The nerves of teeth were first described by the famous Greek physician Galen (see GALEN). During the medieval period dental knowledge was preserved and advanced by the Arabs. From them the art was transmitted to French surgeons, who remained the leading influence from the sixteenth to the eighteenth centuries. Scientific dentistry received its start from a Frenchman, Pierre Fauchard (see FAUCHARD, PIERRE), who studied the entire field of dental knowledge and wrote the first complete book on dentistry, *Le chirurgien-dentiste* (1728).

American dentistry developed with the immigration of French and English dentists during Colonial times. Throughout this period and for nearly 70 years after the American Revolution dentistry was practiced in the new world as both a trade and a profession. Barbers, mechanics, blacksmiths, jewelry makers, and hairdressers pulled teeth and made crude replacements. The American Revolutionary hero, Paul Revere (see REVERE, PAUL), a silversmith and engraver by trade, took up dentistry as a side line and advertised his practice in a Boston paper in 1768. John Greenwood made at least two sets of artificial teeth for George Washington, one of which is preserved in the museum of the Baltimore College of Dental Surgery.



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This diagrammatic drawing shows the progress of decay at two points, *F* and *ap*. *B*, bristle of toothbrush; *E*, tooth enamel; *D*, dentine; *P*, pulp; *Pr*, probe or explorer; *SD*, secondary dentine. The damaging inroads of decay are shown at *X* and *ap*.

Modern Era. In 1840 a new era began in dentistry when Horace H. Hayden (1769–1844) and Chapin A. Harris (1806–60) organized the first dental school in the world—the Baltimore College of Dental Surgery, which later became the Maryland Dental College of the University of Maryland. The ability to read and write English were the only prerequisites for entrance into the Baltimore College, where the course of study was six months. Prior to the opening of the school and for nearly 50 years afterward, training was given primarily by apprenticeship to a dentist for a number of years. Some historians claim that the medical college of the University of Maryland had refused Hayden and Harris permission to lecture there in dentistry because the faculty felt that the subject of dentistry was of little consequence; to this alleged action these historians attribute the founding of the dental school. Whatever the true story of its origin may be, this separate school removed dentistry from control by medicine and its traditions and enabled the young profession to develop unhampered, encouraging the application of new techniques and discoveries as soon as they had proved successful. As a result American dentistry gained world leadership, in both improvement of methods, instruments, and materials, and in professional standing. The last half of the nineteenth century was a period of invention and mechanical progress in the United States and during that time American dentistry made great advances in the mechanical restoration and replacement of teeth. Dentists from all over the world came to the United States to study these techniques.

A young patient, left, is examined for teeth that are out of line after the loss of a lower molar. Below, space maintainers will help to re-establish occlusion when teeth are missing. Without the maintainers, the remaining teeth will drift, crowding the new ones.
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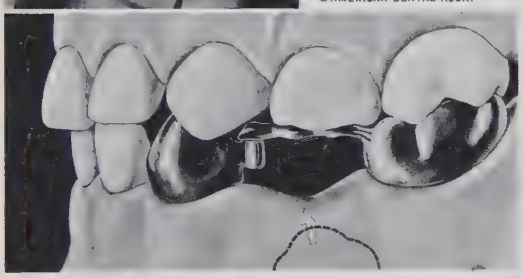

Spaces between the front teeth of the little girl, right, indicate that the jaws are growing to make room for permanent teeth. The spaces will eventually close. Below, the X-ray photograph of the mouth of a child shows the displacement of baby teeth.
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In 1834 the first significant dental society, the Society of Dental Surgeons, was organized and in 1839 the *American Journal of Dental Science*, the scientific periodical of the profession, was published. Horace Wells, a dentist of Hartford, Conn., in 1844 was the first to demonstrate the use of nitrous oxide as a general anesthetic when he used it while extracting teeth. In 1846 W. T. G. Morton, a Boston dentist, was the first to use ether for general anesthesia in a surgical operation.

The number of dental schools increased very slowly until about 1880. Between 1880 and 1900 many private dental schools were organized and operated for profit but after 1900 these schools either closed or merged with universities. The requirements for admission to dental schools were gradually increased until two years of college study became a prerequisite. The course of study in dental school gradually increased, and became four years after 1920. The curriculum includes the basic sciences of biochemistry, anatomy, histology, physiology, pharmacology, pathology, and bacteriology; special courses in dental anatomy, physics of dental materials, operative and prosthetic technical skills; and techniques of specialty fields. The student gives a great deal of attention in the two final years to clinical practice, performing operations on patients. The dental degree, D.D.S. (Doctor of Dental Surgery) or D.M.D. (Doctor of Dental Medicine) is awarded on satisfactory completion of the course.

Practice

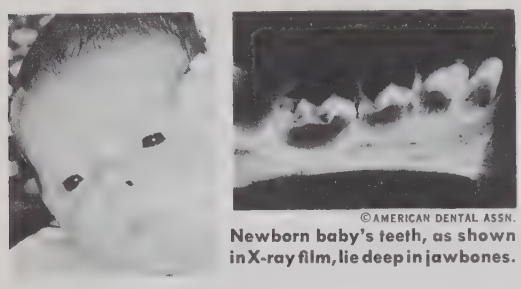
The practice of dentistry is regulated by license in all states of the United States, the Canadian provinces, and in many other countries. In the United States the examination for license is conducted by the state board of dental examiners and includes questions on all subjects in the dental curriculum, as well as practical work on patients and in the laboratory. Officers in the U.S. Army, Navy, and Air Force, Veterans Administration, and U.S. Public Health Service may practice wherever assigned while on duty, but they are not usually given appointments until they have secured at least one state license. After obtaining a license a dentist is legally qualified to diagnose and treat patients, rendering every service which comes within the scope of dentistry. Many dentists, however, refer some patients to specialists who have had advanced training in the particular service required.

Specialties. The specialties in dentistry include the following fields: orthodontia, oral surgery, periodontia, pedodontia, prosthodontia, endodontia, oral pathology, and dental public health. Every dentist has the legal right to limit his practice to any of these specialties but does not usually announce himself as a specialist unless he has had certain additional training in the particular field of interest. To gain official recognition, the dentist must have had five additional years in the specialty in question. Two of these years must be spent taking advanced study in a recognized institution. After that he must pass a very rigid examination in the specialty. In addition, a few states require an examination and a specialist's license. Except for endodontia the fields of practice listed above are the official specialties.

Orthodontia. Malocclusion or improper alignment of the teeth are orthodontic problems, which are usually treated in patients who are between the ages of eight and 16. The causes of malocclusion are becoming more fully understood as a result of research in the growth and development of the face and jaws, and the methods of treatment, commonly referred to as straightening the teeth, have been

greatly refined and improved. See Orthodontia; Teeth.

The orthodontist makes a careful study of the causes of malocclusion in the individual patient and plans a program of treatment which conforms to the natural growth of the jaws. Treatment frequently requires one to two years, during which appliances are cemented to the teeth to guide them to correct position and interrelationship. Correction of malocclusion not only restores facial symmetry and improves the appearance but restores proper occlusion which tends to maintain the mouth in a healthy and functionally useful condition.



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Newborn baby's teeth, as shown in X-ray film, lie deep in jawbones.

Oral Surgery is the diagnosis and treatment by surgical means of the diseases and deficiencies of the mouth and jaws. A large part of the oral surgeon's service is the extraction of teeth and treatment of infection associated with decayed and neglected teeth. He also removes impacted and unerupted teeth, cysts of the jaw, benign tumors, and excessive growth of gum tissue or bone, performs operations to improve the shape and contour of the ridges of the jaw to receive artificial dentures, and treats fractures of the jaws. The maxillofacial surgeon, or oral and plastic surgeon, usually has a medical as well as a dental degree and several additional years of training. As a result he is prepared to care for malignant tumors of the face and jaws, to perform plastic surgery and operations for the correction of cleft lip and cleft palate, and to care for more serious injuries of the face and jaws. See Cancer; Tumor; Cleft Palate.

Periodontia is the treatment of diseases of the gums, one of the most frequent causes for loss of teeth after 30 years of age. Periodontal disease (sometimes called pyorrhea) is an insidious, slowly developing condition in which the gums are sore and inflamed (gingivitis) and the attachment of the tooth to the bone is slowly destroyed, causing the teeth to become loose and sore. Low grade bacterial infection is always associated with periodontal disease and aggravates it but is not the principal cause. The periodontist treats such disease by insuring thorough and persistent cleanliness, improving bodily health, correcting uneven pressures in mastication, and carrying out local medicinal or surgical procedures. Although many dentists specialize in periodontia, most of the periodontal treatment must be given by the family dentist, especially the most rewarding preventive aspects.

Pedodontia is restricted to dental care of children and is or should be principally a preventive program. (See Dentistry for Children.) Much of the dental care for children is in the hands of the family dentist but there are a few hundred qualified pedodontists in the United States.

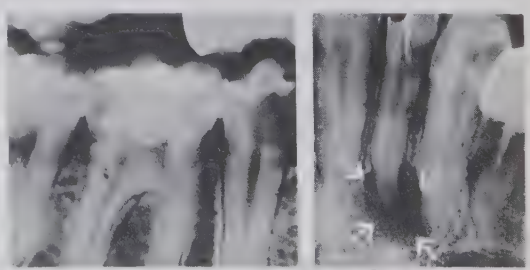
Prosthodontia, or prosthetic dentistry, is the practice of artificial replacement of missing teeth. The replacement for an entire set of teeth is a full denture; the removable appliance which replaces only part of the set is a partial denture. One or more missing teeth are often replaced by a fixed bridge, usually constructed of gold or porcelain and attached at each end by means of a crown or other restoration in a natural tooth. The crown is a metal or porcelain cap covering the entire exposed surface of the tooth.

Artificial teeth are usually made of porcelain, although plastic materials have also become popular. Manufacturers produce a great variety of shapes and colors to fit any need and they are very artistically designed and natural in appearance. These teeth are attached to a plastic base constructed to fit the mouth. Partial dentures may have a metal framework, usually of gold, with clasps or other intricate devices which fit about the natural teeth to increase stability. The restoration of missing teeth requires a wide scientific knowledge of both biology and physics, for the replacements must be natural and attractive in appearance, must fit the ridge of the gums perfectly, must be planned for mastication in conformity with the intricate movements of the temperomandibular joint of the jaw, and must be perfectly balanced to avoid uneven stress which may cause resorption of the bone beneath the dentures. Most prosthetic service is rendered by the family dentist since there are comparatively few specially trained prosthodontists. Much of the mechanical construction of prosthetic appliances to replace missing teeth can be delegated to dental laboratory technicians. The dentist plans and designs the replacement and the technician carries out his instructions in the laboratory. Although a few dentists in America and many in Europe engage and train their own technicians, independent dental laboratories construct most of the prosthetic appliances in the United States. See Dentistry, Careers in.

Endodontia is the treatment and filling of the root canals of the teeth. When a cavity in the tooth becomes large it approaches the pulp—the central canal filled with tissue, blood vessels, and the nerve supply. When irritated or infected, the pulp dies and may cause infection in the bone beyond the root end. Treatment includes cleansing and sterilizing the pulp canal and inserting an inert filling to seal the end. Pulps may also be removed before infection begins, increasing the probability of successful treatment. Root canal treatment is difficult and tedious, and is not always successful in spite of skillful operations.

Oral Pathology. Specialists in this field, like the general pathologist, examine and diagnose tissues which have been removed from the body. Examination usually includes microscopic studies and is most frequently employed in cases of suspected cancer and other tumors and in research studies of tissue changes due to disease. Most of the oral pathologists are engaged in teaching and research.

Dental Public Health. Specialists in dental public health act as consultants to state health authorities to enable them to utilize new preventive techniques such as fluoridation of water supplies, to develop scientific and educational media, and to make diagnostic laboratories more available to dentists. They may teach courses in dental public health in dental schools. Researchers in the field study the effects of dental disorders on general health, new methods of dental surgery, the prevention of tooth decay, the correction of disorders such as hairlip and cleft palate, and the cause and treatment of diseases such as pyorrhea and oral cancer.



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X-ray films are invaluable in disclosing recurrent decay and hidden infection in teeth. At left, decay undermines old fillings; at right, abscess indicates serious trouble.

Operative Dentistry. Although it is also a specialty, operative dentistry is the principal basic service given by the family dentist. It consists of the control of dental caries (see CARIES) by removing the decayed material in the tooth, preparing a suitable cavity, and restoring the normal contour of the tooth with gold, silver, plastic, or other types of filling. The preparation of the cavity to receive the filling is an exacting technical skill and requires great care and precision in the use of instruments and drills.

Scientific cavity preparation was standardized in the last decade of the nineteenth century by G. V. Black (see BLACK, GREENE VARDIMAN), the father of modern dentistry. The principle of "extension for prevention" was developed as a result of Black's research and consists of enlarging the cavity so that all margins of the new filling will be placed in an area of the tooth which is easily kept clean by mastication and brushing. Although new methods of cutting cavities by high speed diamond points have been introduced, the basic principle of extension for prevention remains as standard procedure. The use of local anesthesia, which affects the nerves, and a water spray to maintain a cooler temperature during drilling have been successful in making cutting painless. There are many recent developments in the procedures of operative dentistry: new methods of cutting cavities, new techniques of taking impressions of prepared cavities and constructing inlays in the laboratory, and improved methods of manipulating the filling materials. These procedures, and others in the experimental stage, make possible complete dental service with more comfort and with shorter dental visits by the patient. See DENTAL HYGIENE.

Aids. X-ray films of the teeth are important aids in diagnosis. They are used in every branch of dentistry to determine the presence of infection or other disease conditions, to facilitate extraction of teeth by discovering the size of the roots and the condition of the surrounding bone, to assist in early discovery of caries (decay) between the teeth, to determine the changes in the bone in periodontal disease, to observe the progress of calcification of teeth not yet erupted in children, and to discover any variation from normal in any of the teeth and surrounding structures. General anesthesia has been used by dentists since its discovery, but since about 1912 the use of local anesthesia has become increasingly popular and only a comparatively few dentists use general anesthesia in office practice (see ANESTHESIA). Local anesthesia is obtained by hypodermic injection of an anesthetic solution into the tissues to be cut, or about the nerve supplying the area. The agent most used has been 2 per cent procaine (see LOCAL ANESTHETIC). Local anesthetic is employed for almost every dental operation which might otherwise be painful, from filling teeth to removing them.

RESEARCH AND COMMUNICATION

Significant dental research was done during the eighteenth century in England and France and during the nineteenth century in England, Germany, and the United States. These contributions to advanced knowledge were usually from dedicated scientists who worked alone and explored a narrow field of their special interest. In 1920 the International Association for Dental Research was organized in the United States, with chapters in other countries. The *Journal of Dental Research* was established as the association's official journal.

Dental schools continue to do much of the significant research and such studies are financed by the universities, by grants from commercial corporations, and by grants from government. Since 1940 the U.S. government has participated more extensively through the U.S. Public Health Service and the dental corps of the military services. Textbooks and reference books pertaining exclusively to dentistry are numerous and cover all subjects in the dental field. Journals and bulletins are with a few exceptions owned and published by dental societies and associations and are circulated primarily among their membership. There are more than 150 dental periodicals published in the English language. See AMERICAN DENTAL ASSOCIATION; CANADIAN DENTAL ASSOCIATION.

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DENTISTRY, CAREERS IN. There are about 85,000 dentists in active practice in the United States. This number is not sufficient to provide all of the dental care needed by the rapidly growing population. There is a continuing need for more dentists, not only to meet the current demands but to provide adequate care in the future.

The services of dentists are required by a very large proportion of the population each year. Almost all persons suffer from oral disease at some time during their lives; dental caries (see CARIES), or tooth decay, is one of the most prevalent diseases in the United States. Moreover, 20 per cent of the nation's children suffer from severe deforming irregularities of the teeth and jaws, and 25 per cent of the population over 15 years of age wear one or two full dentures as a result of previous dental disease.

Education. Dental education is provided through the facilities of about 45 dental schools which annually accept about 3450 freshmen, of whom 93 per cent will graduate at the end of their four-year program of professional study. While a minimum of two years of college or university training is required for admission, more than three-fourths of the applicants have had more than the minimum amount of preprofessional education and nearly half have received degrees before entering dental school. In general, for admission to dental school the applicant must have demonstrated competence to complete college-level work and must have had courses in English, biology, inorganic chemistry, organic chemistry, and physics. The applicant's aptitudes, as measured by examinations in such areas as manual dexterity, reading comprehension, visualization of three-dimensional patterns, mental ability, and subject matter are also considered by the admission committees of all dental schools.

Practice. Although the majority of dentists enter what is known as general practice, there are many areas of specialized activity open to the graduates of dental schools who have acquired either the degree of D.D.S. (Doctor of Dental Surgery) or D.M.D. (Doctor of Dental Medicine). Both degrees provide the same privileges and are acquired through the same curriculum. There are eight officially recognized dental specialties—oral surgery, periodontics, endodontics, pedodontics, orthodontics, prosthodontics, oral pathology, and dental public health. There are also opportunities for research workers in the field of dentistry and for teachers in both clinical dentistry and in the basic science fields related to dentistry. There has been a rapid growth in the field of research

dentistry and much of this work is being conducted in such basic science fields as pathology, biochemistry, physiology, bacteriology, and anatomy. This emphasis on research in the basic sciences results partially from the increased recognition given to preventive dentistry. It is important for the potential dental school applicant to know of the wide opportunities in the fields of dental research and teaching as well as the fields of oral diagnosis and operative dentistry.

Related Specialties. As the need for dental care increases there is a greater demand for specialized auxiliary personnel. Dental hygienists, for example, administer dental prophylaxes to patients and perform other duties; they can practice only under the supervision of a licensed dentist. Both dentists and dental hygienists are licensed by boards of dental examiners who evaluate the competence of the licensees and require that they be graduates of recognized schools. Dentists also employ dental assistants, whose responsibilities in the dental office range from chairside assisting to secretarial and receptionist duties. The dentist also utilizes the assistance of the dental laboratory technician who, at the direction and through the prescription of the dentist, fabricates various appliances which the dentist uses in making restorations for the patient. Recognized programs for training dental hygienists and dental laboratory technicians require two years in a special curriculum; dental assistants are trained by dentists in their offices for periods ranging from a few months to 18 months.

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DENTISTRY FOR CHILDREN, or pedodontics, is the dental specialty limited to the treatment of children's teeth. Pedodontists treat patients from birth to 16 years of age. The objectives of pedodontics are: to preserve the teeth of the child in a healthy condition, to prevent the loss of a part of any tooth by decay, to restore any parts of teeth lost by decay or by accident, to eliminate any source of infection from the mouth by appropriate treatment, to maintain the proper amount of space for the eruption of the ensuing permanent tooth if a primary tooth is lost prematurely, to counsel with the patient and his parents regarding such abnormal pressure habits as thumbsucking, which may result in the teeth assuming abnormal positions in the dental arch and cause what is known commonly as "crooked teeth," to inform the child and his parents of the importance of brushing the teeth, to counsel the child and his parents on diet, and to advise the parents about the need for orthodontic treatment. See ORTHODONTIA.

Every normal human being acquires two complete sets of natural teeth. The first, or primary, set consists of 20 teeth; the second, or permanent set has 32 teeth. The primary teeth begin to erupt when the child is about seven months of age and all 20 teeth are usually present by the time the child reaches his third birthday. Primary teeth are usually lost in the same order in which they erupted. The first primaries will be lost shortly before the sixth birthday and replaced soon thereafter by the first of the permanent teeth, the two lower central incisors. The last of the primary teeth are usually lost before the child is 12. The permanent third molars, or wisdom teeth, as they are commonly called, may erupt as early as the sixteenth birthday. See TEETH; TEETHING.

During the period of their function the primary teeth are just as important to the child as are the permanent teeth to the young adult. Unfortunately, many parents assume the primary teeth to be temporary and therefore unimportant. It is during childhood years that the individual should learn to chew foods properly in order to prepare them for digestion and swallowing; consequently, a healthy primary set of teeth is most essential for the small child. It is also important that the child be free from the chronic infections which often occur in neglected and diseased mouths.

The most common dental affliction of children is tooth decay, or dental caries (see CARIES). Prevention is the ideal treatment for the problem of dental decay. Much can be done by the individual to prevent decay of his own teeth; for example, it is evident that it is best to avoid substances containing heavy concentrations of sugar. Foods such as confections, jellies, pastry, and cake frostings, and many of the popular soft drinks contain large quantities of sugar. Dried fruits, particularly those to which sugar has been added, have also been proved detrimental to certain children. Occasionally the vehicles for administering medicines, vitamins, and tonics, particularly when used over a long period of time, have proved harmful. A diet of meat, fish, vegetables, fresh fruits, coarse bread, butter, milk, and other dairy products is basically the best one to assure good health, adequate growth, and healthy teeth.

When decay of a tooth does occur, it should be treated immediately. For this reason it is important that a child visit the dentist about the time of his second birthday. Additional visits should be made regularly thereafter at intervals of three to four months or as directed by the dentist. This procedure is also a good method for training the young child to accept dental treatment.

In order to help discover cavities in their early stages the dentist may make X-ray pictures of the teeth and the supporting tissues; in many instances X-ray pictures show cavities before they can be discovered by any other means. Diseased teeth should be restored promptly so that they can again function normally and without disturbance to the comfort or health of the child.

Frequently children break one or more front teeth in accidents or games. It is important that broken teeth receive the immediate attention of a dentist. Very often his early treatment will mean the difference between retaining and losing the teeth.

Mouth infections in children should be treated promptly; otherwise they may cause serious systemic illness which may impair the general health for life. In addition to the possibility of systemic disease, there will be discomfort in chewing food, frequent pain and swelling, and general debility. If infected teeth cannot be treated so that all of the infection is removed, they should be extracted; it is healthier to be without a tooth than to retain an infected one.

If a primary tooth is lost prematurely, it is usually wise to use an appliance called a space maintainer to allow the easy eventual eruption of the permanent tooth. Similar to a bridge, although simpler in design and construction, space maintainers are removable by the patient in many instances. Whenever the loss of a single tooth or of several teeth occurs in the primary or permanent dentition, the remaining teeth may drift out of their normal positions; this drifting may become the indirect cause of cavities or pyorrhea, a condition characterized by a loosening and eventual loss of the teeth.

In order to have attractive, white, straight teeth, children should adopt certain practices and avoid others that may prove detrimental. Placing abnormal pressures on the teeth should be avoided; grinding the teeth together (bruxism) and thumbsucking are common examples of excessive and abnormal pressures. One of the more difficult problems with which the dentist is confronted is attempting to overcome these habits. They are of psychological origin and

DENVER VISITORS BUREAU

The Colorado Rockies lie in the background in this view of the City and County Building in Denver's Civic Center.

should be treated psychologically. Thumbsucking is confined almost always to childhood; bruxism may occur at any age.

Brushing the teeth and rinsing the mouth are the two best ways to maintain a clean mouth (see DENTAL HYGIENE); it is important, however, that the cleansing be done at the proper times. The most damaging single substance to teeth is sugar, so that after eating foods containing high proportions of sugar the mouth should be rinsed. Simple as it appears, the dentist has difficulty in teaching the importance of consistent and thorough brushing of the teeth. It represents a discipline which the individual must impose on himself.

Orthodontia. The size and shape of the jaws change greatly from birth to the age of 16 years. The teeth erupt and move through intricate but correlated paths as they take their correct positions in the mouth. Dentists know what these paths are and can usually determine when the teeth are not erupting properly. It is a responsibility of the dentist who serves children to be able to advise parents regarding the need for orthodontic treatment, or straightening the teeth. Frequently he will advise consultation with an orthodontist, if orthodontic treatment proves to be advisable to place the teeth within normal limits of function and aesthetics. Teeth in normal position are also easier to keep clean and therefore normally decay less readily. GEORGE W. TEUSCHER, D.D.S.

DENTON, city, N central Texas, county seat of Denton County, on the Missouri-Kansas-Texas, the Santa Fe, and the Texas and Pacific railroads, and U.S. highways 77 and 377; 35 miles NW of Dallas. The principal manufactures are clothing, furniture, metal fixtures, flour, brick, concrete products, and beverages. Denton is the seat of Texas State College for Women and North Texas State College. Pop. (1950) 21,372.

D'ENTRECASTEAUX ISLANDS, a group of volcanic islands, SW Pacific Ocean, E of New Guinea, belonging to Australia and administered with the territory of Papua; area about 1200 sq. mi.; pop. about 40,000. Important islands in the group are Fergusson, the largest, Goodenough, Normanby, and Dobu. The topography is mountainous with the highest peak, 8500 feet, on Goodenough Island. There are extinct volcanoes, hot springs, and geysers. The chief occupation of the inhabitants is the collection of coconuts and pearl shells. The group was named for the French navigator and explorer, Joseph d'Entrecasteaux.

DENTURE. See DENTISTRY.

DENUDATION is the geological process of removal of surface material by wind, rivers and streams, and glaciers (see EROSION). The rate of denudation by streams or rivers is dependent upon the velocity and volume of the water, the amount of material suspended in the water, and the character of rocks or soil over which the water flows.

DENVER, city, capital of the state of Colorado, N central Colorado, coextensive with Denver County, on both sides of the South Platte River, at the mouth of Cherry Creek, in the E foothills of the Rocky Mountains, 920 miles WSW of Chicago, 949 miles E of San Francisco. Pop. (1950) 415,786.

Denver is the largest city in Colorado and the principal urban center of the Rocky Mountain states. Located on the high Great Plains at an elevation of 5280 feet above sea level at the capitol, Denver is known as the Mile High City. It enjoys a dry, healthful climate with abundant sunshine. Annual precipitation averages about 14 inches. The January average temperature is 30°F and the July average 72°F. Over the year the average temperature is 50°F.

Economic Life. Denver is one of the great transportation hubs of the West. Seven major railroads enter the city: the Union Pacific, the Colorado and Southern, the Denver and Rio Grande Western, the Santa Fe, the Burlington, the Rock Island, and the Denver and Salt Lake. Since the completion of the Moffat Tunnel (1928) and the Dotsero Cutoff (1934) through the Rocky Mountains, Denver has had a direct rail route to the West Coast. U.S. highways 6, 36, 40, 85, 87, 285, and 287 all pass through the city. Three transcontinental bus systems serve Denver. The city's municipal airport, Stapleton Field, located on the northeastern outskirts of Denver, provides transcontinental and regional air services.

The city is a great commercial, financial, and manufacturing center serving a wide area of the Rocky Mountain states. Among important manu-

BURLINGTON ROUTE

Noted for excellent acoustics, Red Rocks Amphitheater in one of Denver's mountain parks is dominated by massive Stage Rock. The theater has a seating capacity of 10,000.

factures are food products; livestock feeds; agricultural machinery; aircraft parts; photographic equipment; mining, railroad, and electrical equipment; rubber, metal, and wood products; textiles; clothing; and footwear. Denver is also a center for printing and publishing, oil refining, automobile assembly, and livestock marketing.

Government and Public Welfare. Denver has a unified city and county administrative system with a mayor and council government. The city is the center for branches of the state government. Since more than 200 federal government agencies including a mint and a customhouse are administered from Denver, the city is sometimes referred to as the second capital of the United States. Lowry Air Force Base, at the southeast city limits, was the temporary site of the U.S. Air Force Academy.

Medical institutions located in Denver include a medical center with a school of medicine, the Colorado General Hospital, the Denver General Hospital, the National Jewish Hospital, Veterans Administration Hospital, and several other hospitals and sanitariums. Fitzsimons Army Hospital is located just east of the city limits. The city also contains a state home for dependent and neglected children.

Denver's public school system consists of elementary schools, junior and senior high schools, schools for the handicapped, and an opportunity school that offers a wide range of practical instruction. There are several Roman Catholic elementary and high schools and a number of other private educational institutions. Higher education is provided by the University of Denver (founded 1864), Colorado Woman's College, Loretto Heights College, Regis College, the Conservative Baptist Theological Seminary, the Methodist Iliff School of Theology, and Westminster Law School. The University of Colorado School of Medicine is located in Denver. There are also nursing schools and institutions offering training in technology, business, and the arts.

Recreational Facilities. Denver and its environs offer such a wide variety of recreational attractions that catering to tourists has become one of the main industries of the city. Many recreational facilities are provided in more than 50 named city parks. The principal city parks are Berkeley Park with a beach and sports facilities; Cheesman Park with a fine view of the Colorado Rockies; City Park, the largest park, with a zoo and facilities for nearly every sport; Mountain View Park, offering a panoramic view of the Rockies; Sloans Lake Park for water sports and other activities; Washington Park, with two lakes, flower gardens, and playgrounds; and Observatory Park containing Chamberlin Observatory. There are six municipal and public golf courses in addition to several private courses.

Denver has its own mountain parks system with nearly 30 named parks and more than 20 unnamed properties that are connected by about 100 miles of scenic highway. Notable attractions in the parks include the Mount Evans Summit Drive, covering North America's highest automobile road, to the top of Mount Evans (14,260 ft.); Evergreen Lake and Dedisse Park, with a scenic mountain lake and sports and picnic facilities; the Park and Theater of the Red Rocks, containing a natural theater; the tomb of William F. Cody (Buffalo Bill) on Lookout Mountain; Genesee Park, with wild game in its natural habitat; and Winter Park, one of many fine ski areas in the locality.

Buildings. Denver is a notably beautiful city, primarily residential in character. Standing in spacious grounds on a terraced hill in downtown Denver is the Colorado state capitol. Patterned after the national capitol, the Colorado capitol is built of local granite and has an imposing dome covered with gold leaf from Colorado mines. The dome affords a splendid view of the Rocky Mountains, Pike's Peak, 75 miles south, being visible in clear weather. North and south of the capitol is the state office building and annex.

West of the capitol is Denver's Civic Center with fine buildings, gardens, and statuary. On the south side of the Civic Center is a Greek outdoor theater and on the north side is the Main Public Library. The main library and its branches elsewhere in the Center and throughout the city contain a notable collection dealing with the history of western United States. Adjacent to the Civic Center on the west is the Denver City and County Building. Housed in part of the building is the headquarters of the Denver Art Museum, with a famous collection of Indian and other art. West of the City and County Building is the United States Mint, a replica of the Medici Bank of Florence. Just north is the modern Hospitality Center, which provides free information service for visitors. South of the capitol is the Colorado State Historical Museum, which displays relics of the early Indian inhabitants and pioneers of the West. Other notable buildings are the Colorado Museum of Natural History in City Park, the Denver Post Office and Federal Building, both housing many agencies of the federal government; the Phipps Auditorium, in the same building as the Colorado Museum of Natural History; the Municipal Auditorium; the Denver Coliseum; and the Palace Theater. The principal religious buildings are the Cathedral of Saint John's in the Wilderness (Episcopal), and the Cathedral of the Immaculate Conception (Roman Catholic).

History. The first permanent settlement on the site of Denver, made in 1858 by gold prospectors, was located at the junction of the South Platte River and Cherry Creek and was known as Saint Charles. Its name was later changed to Denver in honor of the territorial governor, Gen. James William Denver. During 1860 Auraria, a rival settlement adjacent to Denver, was consolidated with the future state capital. The pioneer settlement grew rapidly with the attraction of gold and Denver was incorporated as a city in 1861. In 1863 the central section of the city was gutted by fire. In 1867 Denver became the territorial capital and continued to develop rapidly, primarily as a mining center. Great wealth came to some citizens of Denver through rich strikes in gold and

silver. The first railroad to enter Denver was opened in 1870 and other lines soon followed. In 1881 Denver was established by popular vote as the state capital. At the turn of the century the area of Denver was enlarged and several adjacent communities were annexed. The city and county of Denver were created in 1902 and a single charter was adopted for both in 1904, although they retained separate administrations until unified in 1912. A commission type of government was instituted for the city and county in 1912 but was replaced by the present mayor-council form in 1916. During the twentieth century Denver developed as a major agricultural center and became increasingly important as a business, industrial, and tourist center.

DENVER, UNIVERSITY OF, a coeducational institution located at University Park in Denver, Colo. Related to the Methodist church, it was chartered in 1864 by the territorial legislature of Colorado and was first known as Colorado Seminary. In 1880 the University of Denver was made the degree-conferring body of the seminary. The university's major divisions include the colleges of arts and sciences, business administration, engineering, and law, the community college, and the graduate college. Within the colleges are the schools of art, education, hotel and restaurant management, librarianship, music, social work, speech, and theater. Other instructional and research units include the Center for Latin-American Studies and the High Altitude Laboratory on Mt. Evans. See Colleges and Universities.

DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY, an American railway system connecting Denver and Salt Lake City, with many branches in Colorado and Utah. Founded in 1870, the line was originally planned as a narrow-gauge trunk line from Denver to Mexico City along the general course of the Rio Grande del Norte. Discovery of gold at Leadville, Colo., in 1880 turned attention westward and a through line to Salt Lake City was opened in 1882. Other branches were built to connect newly developed mining districts. Main line operations have been standard gauge since 1890 but the 45-mile branch from Durango to Silverton, Colo., operating during the summer months, offers the only regularly scheduled narrow-gauge passenger service in the United States. The railroad is famous for its service through the Royal Gorge of the Arkansas River and through the 6.1-mile Moffat Tunnel, 50 miles west of Denver. It crosses the Continental Divide at Tennessee Pass at an elevation of 10,222 feet and Moffat Tunnel at 9238 feet. In 1955 it operated 2164 miles of road. See Moffat Tunnel.

D.&R.G.W. Emblem

DENYS, NICOLAS, 1598–1688, Canadian pioneer and fur trader, was born in Tours, France. Founder of several fishing and lumbering settlements on the coast of Nova Scotia after 1633, Denys published a geographical and historical description of the coasts of Acadia in 1672.

DEODAR. See Cedar.

DEODORANT, a preparation which nullifies offensive odors. It may accomplish its purpose by cleaning, by masking the offensive odor with a pleasant one, by chemically altering the composition of the odoriferous substance, or by removing by ventilation odors which are airborne.

Bathing may control body odors for a short period but cosmetic deodorants may be effective for days. They may contain such masking agents as the essential oils, or cinnamon, eucalyptus, lemon and lavender; or they may contain agents that chemically destroy the substance which creates the offensive odors. Some contain antiperspirants, which prevent functioning of the sweat glands. Chlorophyll, advertised as a cosmetic deodorant, gives little evidence of effectiveness.

Household odors are generally removed by cleaning with soap and water or such disinfectants as solutions of phenol (see Disinfectant). Sprays which contain masking agents, particularly pine, are effective, as is proper ventilation. Certain liquids or silica gel, alumina, or activated charcoal can also be used to deodorize by absorption and adsorption.

Industrial odors are dealt with by masking, diluting, changing their chemical compositions, and removing them by absorption. For airborne odor control inside a plant, masking with other odors and diluting with large quantities of fresh air are the most effective techniques. For controlling odors reaching areas outside the plant, it is almost essential to destroy the offending substance by burning it or otherwise chemically altering it. Many paints for indoor use are formulated with additions that mask the typical paint odor. See Air Conditioning, *Odor Removal*.

DEOGHAR or **DEOGARH,** town, E India, in the state of Bihar, in Santal Parganas District; about 180 miles NW of Calcutta. Deoghar is an agricultural market for rice, corn, mustard, barley, and oilseeds. Coal deposits are found nearby. A pilgrimage center, Deoghar contains Hindu temples dedicated to Siva. Pop. (1951) 25,510.

DEOXIDATION, the removal of oxides from molten metal. It is usually accomplished by adding various materials while the metal is being tapped from the furnace. Common deoxidizing agents used in steel manufacture are manganese, silicon, and aluminum. See Steel.

DEPARTMENT, in a political sense, a division of government or territory. In the United States the three co-ordinate branches of government—the legislative, the executive, and the judicial—are departments. The divisions of the presidential cabinet are also departments, as for example, the Department of State and the Department of Defense, each under the direction of a secretary. Subordinate divisions of the army organization are also departments, such as the ordnance department and the medical department, as is the territorial distribution of the army, such as the Department of the East and the Department of Luzon.

In the United Kingdom the subordinate divisions of the great branches of administrative offices such as the bankruptcy department of the Board of Trade are referred to as departments. In France the department is the largest unit of local government but has only limited governmental autonomy, being primarily an instrument of the highly centralized administration at Paris.

DEPARTMENT STORE, a retail establishment selling wide assortments of varied merchandise, primarily apparel, housewares, and home furnishings. These merchandise lines are normally arranged in separate sections or departments, each with a separate accounting system and management, but the various departments are integrated under a single management.

History. Department stores became widespread in the United States during the latter half of the nineteenth century with the expansion of manufacturing and railroad transportation and the growth of large cities. "Store-bought" goods and trolley cars came together. The growth of the big city newspaper depended upon the financial support of the retail stores. The development of mass production made mass distribution necessary, so that the idea of dividing stores into departments selling different lines of merchandise was adopted rapidly. Before the nineteenth century there existed in some European cities buildings fitted to hold several shops, but these were operated by landlords who merely leased space to

independent shopkeepers. Alexander T. Stewart is often cited as the father of the department store in America. When Stewart opened his Marble Palace in New York in 1846, it carried apparel lines in addition to dry goods. R. H. Macy and Company, founded in 1858 in New York, became the first store to deal in "hard" goods (furniture, tableware, and appliances) when in the 1860s it added books, china, and silverware departments to its lines of "soft" goods (linens, yard goods, draperies). Lord and Taylor, founded in 1826, was the first store to add furniture and shoe departments to its line of soft goods. Other early stores that became leading department stores in the East and Middle West were Jordan Marsh (Boston, 1851), Marshall Field (Chicago, 1852), Mandel Brothers (Chicago, 1855), John Wanamaker (Philadelphia, 1861), Abraham and Straus (Brooklyn, 1865), The Fair (Chicago, 1875), William Filene's Sons (Boston, 1881), J. L. Hudson (Detroit, 1882), and Gimbel Brothers (Milwaukee, 1887).

Farther west, retail stores were started that soon became department stores. D. H. Holmes Company of New Orleans, founded in 1842, was the first store to use delivery service, 1845, when army officers and their wives were stationed at a camp near New Orleans during the Mexican War. The White House, established in San Francisco in 1854, claims to have the first full-page newspaper advertisement published by a retail store. The City of Paris was opened in the same city in 1850 when Felix Verdier, a French merchant, sailed into San Francisco Bay during the Gold Rush with a chartered brig bearing silks, laces, fine wines, and other French products and sold them on the deck of the vessel before moving ashore to open his store. Emery-Bird-Thayer opened its doors in Kansas City in 1863, two years before the first railroad reached the city, and supplied both dry goods and groceries to stagecoach passengers traveling on the Santa Fe Trail. Scruggs-Vandervoort-Barney, Inc., in St. Louis was started as a piece goods and women's apparel store in 1850 in response to the great westward movement of population.

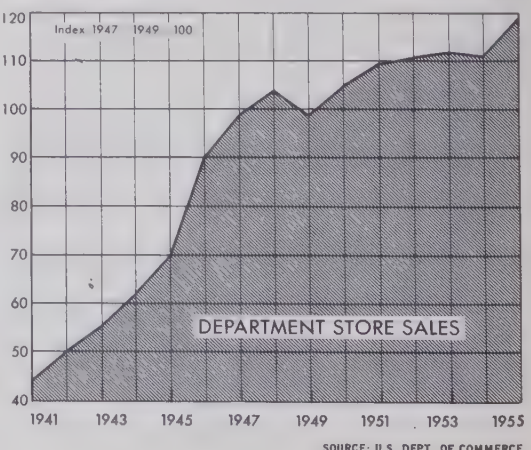
In Canada, Timothy Eaton established a department store, known as T. Eaton and Company, in Toronto in 1862 which was the forerunner of the present-day chain of 35 department stores and a large mail-order business. Simpson's Ltd., another leading department store in Toronto, was founded in 1872 and developed into a chain of several department stores, 300 order offices, and more than 60 commission agency stores.

Role of John Wanamaker. Many of the early innovations in department store operation were started by John Wanamaker, a Philadelphia merchant. He converted a railroad freight depot into a department store with counters not only for dry goods, but also for notions, leather goods, toilet articles, trunks, and other items. He adopted the fixed-price system, with all goods marked in plain figures, and he permitted his customers to return purchased items for refund or exchange if found not satisfactory. Wanamaker had to change the customary ways of doing business in both his buying and his selling. Manufacturers were reluctant to sell directly to retailers, since both were usually small and dependent upon wholesalers. Much of Wanamaker's success was based upon selling men's ready-to-wear clothing, although most men had had their suits made by tailors, and there had been no basis for sizing ready-made suits until the Civil War when the outfitting of soldiers in uniforms made possible standard sizes. Wanamaker's store was the first to use electric lights, when Thomas Edison built an electric power plant to light the store in 1878. This led to the use of electric fans in 1879. By 1881 the store had the largest space in the world devoted to retail selling on a single floor, with nearly three acres of ground floor space; it had 46 departments and more than 2000 employees. Wanamaker was also a pioneer in improving treatment of employees, and his workers received paid vacations, bonuses, commercial training, summer camp trips, and other benefits.

Organization of a Typical Store. A department store is primarily designed to make it easier for the customer to buy. Usually, a store is operated by a general manager, and under him there is a general merchandise manager, a general operating manager, a publicity director, and a controller. The acquisition of new merchandise is the responsibility of the general merchandise manager, who may have divisional merchandise managers to assist him. One may be in charge of all the apparel buyers, while another may supervise the furniture buyers. Each buyer in a division may specialize in a certain kind of merchandise, so that the house furnishings merchandise manager may have a chinaware buyer, a glassware buyer, a lamp buyer, and other specialists to assist him. The general operating manager has charge of all sales personnel and physical handling of goods, such as receiving, opening, marking, storing, and other steps in preparing merchandise for the counter. The publicity director supervises the advertising program, window displays, and interior displays. The advertising program may consist of newspaper, radio, television, and direct mail. The controller has charge of accounts payable, accounts receivable, payroll, credit, collection, and other similar duties. Because of the widespread use of installment purchases and monthly charge accounts (which by 1950 surpassed cash sales) the administration of credit is an important aspect of store operation.

Department stores are able to attain only a small return from their total sales because of the various outlays necessary in purchasing goods to be sold and in performing the services that customers want. The chief costs may be broken down as follows: (1) acquisition cost (cost of goods to be sold, and buyers' salaries and travel expenses); (2) counter costs (receiving, storing, and preparing stock); (3) explanation costs (wages of sales personnel, sales promotion expenses); and (4) adjustment costs (credit, delivery, adjustments, complaints, and similar services designed to keep the customer satisfied with his purchases). The extraordinary variety of merchandise offered by department stores and the high cost of store operations make it necessary that only items that yield a high sales return per square foot of selling space be carried.

To provide goods and services that may be unprofitable for the store itself to operate, some departments are often leased to outside operators. Thus, many stores have leased departments selling such goods as millinery, furs, sewing machines, wallpaper, candy, photographic supplies, optical goods, and shoes. Such conveniences as beauty shops, soda fountains, flower shops, shoe repair, and similar services are often offered through leased departments.



SOURCE: U.S. DEPT. OF COMMERCE

DEPARTMENT STORE

ROBERT SIMPSON CO., CANADA

Robert Simpson Company parent store in Toronto is the nucleus of a chain of department stores that has become one of Canada's merchandising leaders.

MARSHALL FIELD & CO.

The Gift Court on the second floor of Marshall Field and Co., Chicago, conserves the shopper's time by assembling an assortment of items in one area for quick, easy selection.

MACY'S

R. H. Macy and Co., New York, is one of the oldest U.S. department stores.

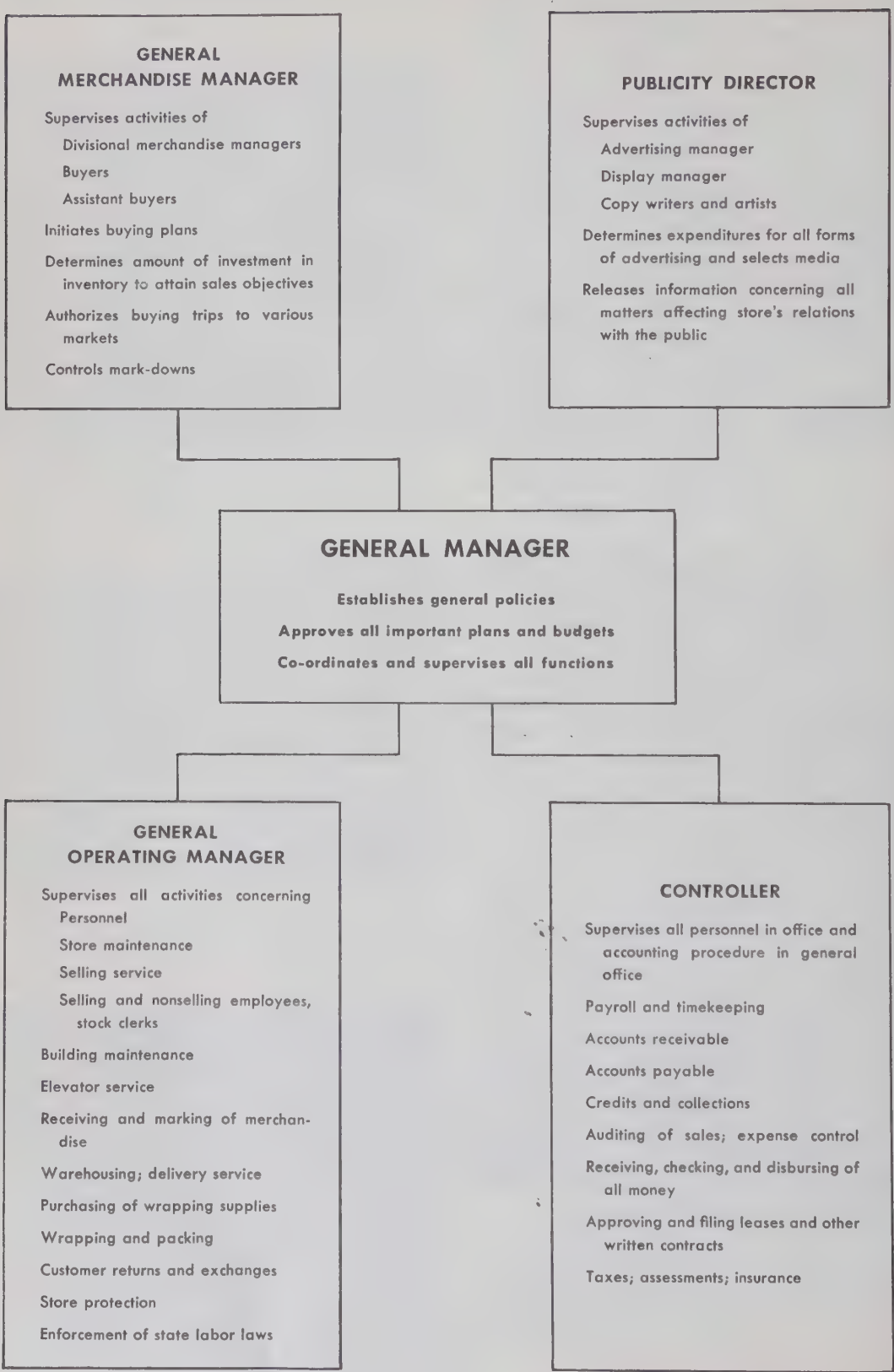
BULLOCK'S

One of the leading West Coast department store chains in the United States, Bullock's has modern establishments in Los Angeles, San Francisco, and other California cities.

Escalator display space is outstanding feature at Neiman-Marcus, of Dallas.

NEIMAN-MARCUS: ©EZRA STOLLER

DEPARTMENT STORE ORGANIZATION



This practice of leased departments started with millinery when store managements found that fashion changes made it impracticable to manage millinery departments themselves. This arrangement was later adopted for other specialized lines that were difficult to adapt to department store operation.

Chain Stores. Department store operation has tended to become multiunit in form as stores have become joined together as nationwide chains, as regional groups, or as stores with several retail outlets in a metropolitan area. The two large mail-order organizations, Sears, Roebuck and Company and Montgomery Ward and Company, were pioneers in developing chains of department stores in the 1920s. By 1955 Sears had about 700 retail stores, including 106 complete department stores in more than 70 cities. After World War II, when it began a large expansion program, Sears extended its retail operations outside the United States with a number of stores throughout Mexico and South America. Among the chains operating solely in the department store field, the two largest are Federated Department Stores, Inc., and Allied Stores Corporation. Federated was founded in 1929, and by 1955, as a result of amalgamations and purchases, it included such well known stores as Abraham and Straus, Filene's, Lazarus (Columbus), Shillito's (Cincinnati), Boston Store (Milwaukee), Foley's (Houston), Bloomingdale's (New York), Halliburton's (Oklahoma City), and Sanger Brothers (Dallas), as well as all of their suburban stores. Besides these established stores, Federated had built stores in a number of smaller communities throughout the country. Each of the stores was given considerable autonomy and retained its own distinguishing characteristics and clientele, but much combined purchasing was done through a central purchasing office. Allied Stores Corporation, with a chain of almost 100 stores throughout the country including Jordan Marsh and Bon Marché (Seattle), also maintained a central purchasing organization.

Macy's, the largest store in the world, has become the main store in another chain operating on a nationwide basis, including L. Bamberger (Newark), LaSalle and Koch's (Toledo), Davison-Paxon (Atlanta), John Taylor Dry Goods (Kansas City), and Macy's in San Francisco. In addition to suburban stores operated in the New York City area, several of the other Macy-owned stores also have branch stores. Marshall Field and Company, the famous Chicago department store firm, began its expansion with suburban stores in 1928, and in the following year it acquired Frederick and Nelson, the largest department store in Seattle.

Recent Trends. Total sales of all department stores in the United States in 1955 amounted to $10.9 billion. This compared with $10.4 billion in 1953 and $10.3 billion in 1954.

The expansion of department stores into multiunit operation became especially noticeable after World War II as stores throughout the country began to build branch stores in suburban districts. With the increasing shift of the urban population into the suburbs, the lack of parking facilities and the establishment of parking restrictions impelled many customers to prefer patronizing stores in outlying districts. The single-unit department store suffered from high overhead as the result of heavy administrative expenses, high-rent locations in the downtown shopping districts, and high buying, selling, and publicity expenses. With branch stores the department store, by using the same buying staff and the same advertising, could acquire and promote merchandise for many outlets without a proportionate increase in costs. Many of the new branch stores were located in suburban shopping centers that brought together a number of retail shops in an outlying tract easy to reach by automobile. A notable example was the Northland Shopping Center, owned and developed by the J. L. Hudson Company department store in Detroit. This unit was opened without advertising in 1954, but it immediately attained a sales volume far above expectations. With a parking area for 7500 cars, the center was planned as a balanced retail shopping area with landscaped areas, sculpture, and pleasant gardens. See Retail Trade; Wanamaker, John. Edward M. Barnet; S. N.

Bibliog.–R. E. Gould, *Yankee Storekeeper* (1948); E. B. Weiss, *Selling to and Through the New Department Store* (1948); G. Baker and B. Funaro, *Shopping Centers: Design and Operation* (1951); H. Conoyer and R. S. Vaile, *Economics of Consumption and Income* (1951); L. Wendt and H. Kogan, *Give the Lady What She Wants* (1952); P. L. Brown and W. R. Davidson, *Retailing* (1953); R. Hower, *History of Macy's of New York, 1858–1919* (1953); E. M. Barnet, *Recent Innovations in Retail Mass-Merchandising* (1954); H. Pasdermadjian, *Department Store: Its Origins, Evolution and Economics* (1954).

DE PAUL UNIVERSITY, one of 226 colleges and universities in the United States under the jurisdiction of the Roman Catholic church, was chartered in 1898 as St. Vincent's College; the charter of DePaul University was obtained in 1907. A coeducational institution, its colleges of liberal arts and sciences and physical education are located in the residential district of Chicago's Near North Side. Other divisions, located in a 17-story downtown center, include the graduate school, school of music, university college, and colleges of law and commerce. For current statistics see Colleges and Universities.

DE PAUW UNIVERSITY, a privately controlled, coeducational institution in Greencastle, Ind., chartered in 1837 by frontier preachers of the Methodist Episcopal church who wished to promote the highest ethical and religious principles in a university which was to be "liberal in principle and accessible to all religious denominations." First known as Indiana Asbury University, the name was changed to DePauw in 1883 in recognition of a gift from Washington C. DePauw. Women were first admitted in 1867. The university consists of three undergraduate schools, the college of liberal arts, the school of music, and the school of nursing, all of which grant bachelor's degrees. Most notable of the 30 buildings on the 60-acre campus is the Roy O. West Library. See Colleges and Universities.

DEPENDENT CHILDREN. See Child Welfare; Social Security.

DE PERE, city, E central Wisconsin, Brown County, on the Fox River, and the Milwaukee and the North Western railroads; 6 miles SSW of Green Bay. De Pere has manufactures of paper, brick, farm equipment, boats, and drugs. It is the seat of St. Norbert College. During the lumbering era in Wisconsin, De Pere marketed 5 million feet of lumber annually. On the site of De Pere, in 1671, Father Claude Allouez founded the St. Francis Xavier Mission, the first permanent Jesuit mission on the Fox River. The French called the place Rapides des Pères. De Pere is an important center on the Fox-Wisconsin waterway. Pop. (1950) 8146.

DEPEW, CHAUNCEY MITCHELL, 1834–1928, U.S. lawyer, wit, and railroad president, was born in Peekskill, N.Y. Famous as a raconteur and after-dinner speaker, Depew was president of the New York Central Railroad, 1885–90, and U.S. senator, 1899–1911.

DEPEW, village, W New York, Erie County, on the New York Central, the Erie, the Delaware, Lackawanna and Western, and the Lehigh Valley railroads and U.S. Highway 20; 9 miles E of Buffalo. Depew was founded in 1893 and named for Chauncey M. Depew. The chief manufactures are machinery, steel castings, textiles, storage batteries, mattresses, and cereals. Pop. (1950) 7217.

DEPILATORY, any chemical substance that removes hair. These substances may be applied in the form of a paste or lotion and act by dissolving the hair. The dissolving agent is often a sulfur compound such as barium sulfide or calcium hydrosulfide, both

of which are somewhat caustic, and thus should be applied with caution and not left on the skin for too long a time.

DEPORTATION, removal by government action of undesirable persons from any area. Deportation involves positive action by the state in effecting the expulsion to some specific region; banishment on the other hand is merely an order to leave the political jurisdiction. In the United States deportation is applied to undesirable aliens who are ordered to be returned to their native lands. In the United Kingdom and most other countries it usually involves the transportation of criminals or other undesirables to penal districts or colonies.

Deportation or transportation is an old system of punishment for crime. After the establishment of the English colonies in America thousands of criminals, convicted debtors, and paupers were transported across the Atlantic. After the 13 colonies gained their independence the English undesirables were sent to Australia; the practice was abandoned in 1840. In France the deportation of undesirables began in 1797 during the French Revolution, and at that time a small group of political offenders were sent out to French Guiana, although from 1853 until 1883 most criminals were sent to New Caledonia instead. In 1936 the penal settlement of Cayenne in Guiana had 5628 men who had been sent out as criminals; many of these persons had previously served terms on the notorious Devil's Island. The penal colony was discontinued by the French government in 1946. In Russia the czarist regime used Siberia for nearly a century before 1917 as a place for the deportation of criminals and political offenders. The Soviet continued this practice. A few other countries have made use of this system of deportation.

In the United States deportation refers exclusively to the expulsion of undesirable aliens. In 1882 provision was made for the removal of Chinese who had entered the country illegally. In 1891 a law provided for the deportation of aliens who had or would become public charges within one year of their entry. Later laws provide for the deportation of alien convicts, insane and feeble-minded persons, illiterates, epileptics, contract laborers, and anarchists; the time limit during which such aliens may be deported varies from three to five years after entry, except for criminals and anarchists, for whom there are no time limits. By a 1929 law deported persons are prohibited from ever returning to the United States. The United States has deported both aliens and naturalized citizens for engaging in crime. Any perjury conviction on gambling, prostitution, or other vice makes a naturalized citizen subject to denaturalization and deportation.

Legal problems have arisen with regard to the rights of persons who are deported. By international law every state has an unquestioned right to expel undesirable aliens. Ordinarily the whole proceeding is conducted by an immigration inspector, with an appeal to the secretary of labor. Court review of such proceedings is limited to so-called jurisdictional facts, which do not permit any judicial determination of the decisive issues. The Supreme Court has held that the constitutional guarantees for persons do not apply.

Deportation has included other types of expulsion by the state. During World War I the Turkish government deported large numbers of Armenians from their homeland to desert regions, and Germany deported several thousand intellectuals and workers from occupied territories, into Germany, especially to the coal mines of Upper Silesia. This practice of deportation was discontinued following the vigorous protest of Pope Benedict XV. The much larger deportations carried out by Germany in World War II are usually considered to be mass expulsions. See Displaced Person; Refugee.

DEPOSIT, in law, the delegating of possession of personal property by the owner or person entitled to possession to some other person to hold for him, subject to the owner's direction as to redelivery. Thus money may be deposited as security, and the depositary should not mingle it with his own funds, but keep it separate until required for indemnity, or until no longer needed for that purpose. A deposit of chattels is known as a bailment. A deposit of money in a bank is not legally the same, as the banker may mingle it with his own funds and is not obliged to return the identical money. See Bailment; Pledge.

DEPOSIT, RIGHT OF. See Pinckney's Treaty.

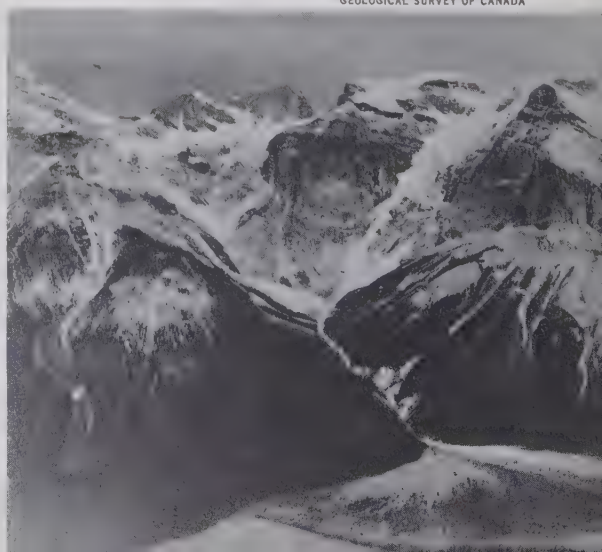
DEPOSITION is a geological process whereby organic and inorganic solids are deposited upon the earth through mechanical, chemical, or biotic action. The process leads to the formation of sedimentary rocks and to mineral accumulations.

Mechanical Deposition. In the formation of sediments mechanical deposition is most important. It involves the gravitational settling of organic material and inorganic dust or rock debris from water or air. (See Clastic Rock.) The sedimentary particles are derived from weathered and eroded rocks or from the skeletons and fibers of dead organisms. Moving water and air transport the particles until some factor interferes with movement. If the velocity of a river, for example, were decreased by encountering an obstruction in the river bed, the water could no longer transport the same quantity of material; hence deposition of the suspended particles would occur. The amount of carrying power of the transporting agent is proportional to the cube of its velocity and inversely proportional to the mass of the particles carried. If the velocity of a river is decreased by one-half, its ability to carry particles is decreased eight times. As the velocity diminishes, the densest particles will be deposited first. Placer deposits, which are an accumulation of heavy mineral grains such as gold and gems, are formed in places where the stream velocity is decreased. Ice, such as glaciers, likewise transports particles, but deposition of the debris carried takes place only as the ice melts; thus, deposits of glaciers are unsorted, the coarse and fine particles being commonly mixed together.

The major sites of deposition on land are volcanic, desert, and glacial regions where wind or ice are the transporting agents, and lakes, swamps, and especially river valleys where water transports the materials. In the sea, sediments are deposited particularly in deltas, on beaches, in lagoons, and on the continental shelves (see Ocean, *Deposits*). Deposits formed within the deep sea are oozes composed of the skeletons of tiny pelagic animals and one-celled plants. (See Diatom; Ooze.) The skeletons of these organisms are

Deposition by glacial action develops an alluvial fan from fragmental material carried by the glacier. Such deposits build up rapidly as the cycle is repeated year after year.

GEOLOGICAL SURVEY OF CANADA



GEOLOGICAL SURVEY OF CANADA

Deposition of material carried by glaciers takes the form of alluvial cones at the foot of steep slopes. Deposition of fragmental material is common in most glacial areas.

U.S. DEPT. OF INTERIOR

Like a vast mud puddle is the wide expanse of sedimentary deposition in the Friant-Kern Canal disclosed during a low stage of the Kern River in the Bakersfield, Calif., area.

soluble under the high pressures of the greatest depths, and thus the floor of the oceanic abysses is covered with only a very slowly accumulating deposit of meteoritic and volcanic dust.

Deposition of sediment resulting from a flood may make the land worthless by covering the rich topsoil, but annual flooding of the Nile Valley has for thousands of years brought rich organic debris from the headwaters, causing a natural fertilization that made possible the rise of Egyptian civilization. Similarly the annual deposition of air-borne particles on the plains of northern China has maintained the fertility of that great grain-raising region.

Minor examples of mechanical deposition may be observed in mountain areas, where talus, rock slides, mudflows, and alluvial fans form locally important landscape alterations caused by gravitational movement of rock debris and soil. (See ALLUVIUM.) The filling of lakes by vegetable debris, forming swamps, bogs, and ultimately forest soil, is an example of mechanical deposition of plant particles with little or no transportation. The occasional meteorite falling to earth from outer space is another example of mechanical deposition.

Chemical Deposition results from precipitation of solids from solution in water. This form includes such notably different phenomena as salt beds and metallic ore bodies. Commercial table salt is obtained from the Great Salt Lake in Utah by allowing the salty water to flow into large shallow basins, from which it evaporates, leaving a deposit of salt. Commercially mined underground deposits of rock salt, such as those in Michigan and Louisiana, are the chemical deposits of ancient dried-up seas. Chemical deposition of iron phosphate directly from sea water in the Cretaceous period (see CRETACEOUS PERIOD) has formed extensive beds of greensand, notably in New Jersey and England. Iron phosphate is used commercially as a water softener and to some extent as fertilizer. Waters containing soluble calcium compounds will precipitate calcium carbonate if, by evaporation or change in temperature, the dissolved carbon dioxide escapes. This phenomenon causes stalactites and stalagmites found in caves (see CAVE) and the formation of limestone beds on the ocean floor.

Ore accumulations are an important result of chemical deposition. Mineral-bearing solutions emanating from magma bodies (see MAGMA) may concentrate their dissolved solids within the crust of the earth; if these occur in sufficient concentration to make it profitable to extract them from the earth they are classified as ores (see ORE).

Deposits Formed by Living Organisms. Peat bogs on land and oyster banks and coral reefs in the sea are examples of deposits formed directly by organisms. Since the woody fibers and the lime skeletons in these deposits are formed by plants and animals, they are biotic deposits. Guano, the continually replenished mass of phosphate-rich droppings of sea birds, is a biotic deposit of the present day, occurring in commercially important quantity on the coastal islands of Chile. Bat guano similarly accumulates on the floors of caves. (See GUANO.) On a much smaller scale, but of great importance to soil fertility the world over, are the worm-castings continually deposited within the soil of farms and gardens by earthworms. See GEOLOGY; MINERALOGY; GLACIER.

EUGENE S. RICHARDSON, JR.; RAINER ZANGERL

DEPOSITION, the written testimony of a witness taken prior to the trial at which it is to be used. Depositions are limited to cases where the witness cannot be produced at the trial or where it would be difficult to produce him on account of age, illness, or the like. The method of obtaining such testimony is strictly regulated by statute. In the U.S. courts it is provided for by an act of Congress and most of the states have passed statutes upon the subject. The testimony is taken before a commissioner in the U.S. Courts and before a master in chancery in the state courts. In federal criminal cases the consent of the defendant is necessary before such testimony can be read; in courts of equity the use of written testimony is usual, but here the reason which renders the taking of testimony so important in courts of law—namely, the jury—is not present, so that the rules regulating all procedure are different.

DEPRECIATION, the accounting practice of assigning the cost of a durable asset over the fiscal periods that coincide with the service life of the asset. Accountants distinguish between internal and external factors limiting the service life of an asset. Internal factors include "wear and tear" from actual use, deterioration, and unusual physical damage; external factors include obsolescence, changes in markets and products, government regulations, and location. Because of the increasingly rapid introduction of innovations and changes in the business environment, external factors, especially obsolescence, have become a more important reason for retiring equipment than is physical deterioration. Depreciation usually does not apply to deterioration of merchandise and materials or to the exhaustion of wasting assets as in the case of depletion of ore deposits.

Depreciation is calculated by estimating the service life of the property and allocating its net cost over the accounting periods during its service life. In the straight-line method, the cost is charged off in equal amounts in each accounting period. Cost may also be charged off at an increasing rate (interest method), decreasing rate (diminishing balance method), or

according to use (production method). Depreciation procedures for taxation purposes have been strongly influenced by government regulations.

DEPRESSION is an emotional or psychic disorder characterized by dejection. There are many gradations of depression. Transient feelings of lowness of spirit are considered normal and are experienced by most people. Mild psychic depressions are evidenced by what are sometimes called temperamental moods; these are transient mood swings from happiness and activity to downheartedness and indolence. Reactive depressions are those arising in response to adversity, bereavement, or any other difficulty that might produce sadness. Neurasthenic fatigue depression, resulting from emotional fatigue, and constitutional inadequacy depression, emanating from physical weariness, are both transitory and mild. Two types of depression are associated with psychotic states. One is involutional melancholia, which sometimes accompanies menopause, in which profound depression and despair and a tendency toward self-accusation are primary symptoms. The other is manic-depressive psychosis, a mental disorder in which the individual is highly elated or deeply depressed; in the latter case depression may become so profound as to result in stupor. See Manic-Depressive Psychosis.

Depressed persons are discouraged, gloomy, and apprehensive; thinking and acting are inhibited according to the depth of the depression and there is a marked loss of self-confidence. All such persons have suicidal tendencies of varying degree.

DEPRESSION, ECONOMIC. See Business Cycle; Inflation.

DE PROFUNDIS, the 129th Psalm (Douay version) or 130th (King James and Revised Standard versions) named from the first two words in the Latin text. The psalm begins: "Out of the depths have I cried unto Thee, O Lord" (*De profundis clamavi ad te, Domine*). One of the seven penitential psalms, it is used in the Roman Catholic liturgy especially in services for the dead.

DEPTFORD, metropolitan borough of London, England, on the S bank of the Thames, 4 miles ESE of Charing Cross. Deptford is a residential and industrial section with docks along the Thames. Industries include the manufacture of naval supplies, machinery, wood products, and metal goods; food processing; and ore refining. Deptford originally developed around a dockyard established by Henry VIII in 1513 and closed down in 1869. During the late seventeenth century Peter the Great, czar of Russia, worked as a shipwright in the dockyard. The dramatist Christopher Marlowe was killed in a tavern brawl at Deptford in 1593. Pop. (1951) 75,694.

DEPTH CHARGE, an antisubmarine weapon consisting of a charge of high explosive and a device that explodes it under water when it reaches a predetermined depth or when it contacts or approaches a submerged submarine. The explosion creates a pressure wave that, because of the incompressibility of water, strikes a submarine's hull with great force. Effectiveness of the explosion depends upon the size of the charge, the distance from the submarine, and the strength of the submarine's hull. A 600-pound charge may destroy a submarine at 30 feet and damage it at 80 feet.

The first depth charges were developed by the British early in World War I to counter the German submarine threat. Nicknamed "ashcans," they were metal drums filled with TNT and provided with fuses that could be set for specific depths. At first they were launched by simply rolling them off the stern of the attacking ship as it passed over and ahead of the submarine's supposed position. Later a sort of mortar was developed to hurl them sideways from both sides of the ship. Using these in combination with stern launching enabled a ship to lay a "pattern" in depth, length, and width and thus increase the probability of destroying the submarine.

OFFICIAL COAST GUARD PHOTO

U.S. Coast Guard cutter, on convoy duty to shield merchant ships, drops depth charges to clear seas of enemy U-boats. Watchers scan sea for telltale signs of a successful hit.

Launching devices were improved and more powerful explosives were used in World War II. Development of sonar also made attacks more effective (see Sonar). New fuse mechanisms in some depth charges exploded them only if they came close enough to a submarine to do damage. These reduced the number of explosions taking place in an attack and thereby made it easier to maintain sonar contact with the submarine.

Related Weapons. Depth bombs are depth charges designed to be dropped from aircraft. They were important antisubmarine weapons in World War II. Several devices known collectively as throwing weapons came into use late in World War II and have since been improved. These fired explosive projectiles that were smaller than depth charges, launching them in clusters from the forward part of the attacking ship to strike the water in a pattern several hundred yards ahead. Their main advantage was their ability to fire at the position of the submarine as indicated by sonar without the attacking ship having to pass over or near the submarine, as it had to do to get into position for a depth-charge attack. Some throwing weapons fired projectiles propelled by rockets; others used cartridges. An example of the latter type was the U.S. Navy's Mark 10 projector which fired 24 projectiles at a time. The projectiles were 7.2 inches in diameter, carried 30 pounds of TNT, and had contact fuses that exploded them if they struck a submarine in their fall through the water. See Submarine.

DE QUINCEY, THOMAS, 1785–1859, English writer, was born in Greenheys, Manchester, where as a precocious, sensitive boy he early sought escape into the imaginary world of dreams. He was given a haphazard education by his intellectual family and, even though he ran away from grammar school and later spent a year in errant truancy in London, he spoke Greek and Latin fluently at the age of 15. In 1802 he entered Oxford and during his second year there first took opium to ease "neuralgic pains," thus

beginning an addiction that was to hound him for the rest of his life (at that time opium could be purchased quite readily, and legally, in England).

He left Oxford in 1808 with the idea of studying law, but in 1809 leased William Wordsworth's old home at Grasmere and began writing for periodicals. There he associated with Samuel Taylor Coleridge and Robert Southey, and continued his studies in classical and especially German metaphysical literature. He married Margaret Simpson in 1816 and with his new family moved in 1820 to London, where he was befriended by Charles Lamb, who helped him get work on the *London Magazine*. De Quincey's best-known work, *Confessions of an English Opium Eater*, first appeared in that magazine in 1821 and established his reputation as a writer. In 1828 he and his family moved to Edinburgh where he wrote for the *Edinburgh Literary Gazette*. After the death of his wife in 1837 he worked even more erratically than before. His five sons and three daughters retired to Lasswade after their mother died, but De Quincey remained in Edinburgh, moving from lodging to lodging and leaving each in turn in charge of his landlady when it became filled with papers. Sorrow over the death of his wife caused him to give in (for a fourth time) to the opium habit. He never really won his battle with the drug, but through sheer will power reduced his daily intake to only six grains by 1844. De Quincey lived as a recluse for most of the rest of his life. His tastes and habits were simple and although he was reckless with money, his modest patrimony lasted until his death. He was buried in West Church yard in Edinburgh.

Because of his precarious financial and social situation De Quincey was forced to turn out a great deal of hack writing of indifferent quality. He ranked literature as the most potent of the fine arts, however, and his best works are couched in a unique and gorgeous prose style. The eloquent prose of *The Confessions* becomes even richer and more exotic in his *Suspiria de Profundis* (1845), likewise a vision of the phantasmagoric creations of his opium dreams. These works and his *Vision of Sudden Death* (1849) exemplify the best qualities of early nineteenth century romantic prose, and the power of their language is such that they will forever be good reading. De Quincey's more realistic works, such as the novel *Klosherheim* (1832) and *The Logic of Political Economy* (1844), do not compare favorably with his more dreamlike creations.

RACHEL GILBREATH

DERAIN, ANDRÉ, 1880–1954, French painter, one of the Fauves who shocked the world of art in 1905 at the Salon d'Automne, was born in Chatou. Derain's early work was much influenced by Matisse, but in the former's painting there was even then a greater concern with problems of technique and construction. After a brief association with cubism, Derain returned to the old masters for inspiration and spent much time copying the works of fifteenth century artists in search of greater perfection in form. His return to realism was called by some critics apostasy and hailed by others as a victory for humanity. But his thorough assimilation of so many diverse influences undeniably produced a brilliant and unique style in modern art that was much respected—if little imitated—by twentieth century artists.

DERA ISMAIL KHAN, city, W Pakistan, in the North-West Frontier Province, capital of the district of Dera Ismail Khan, on the Indus River; about 200 miles W of Lahore. Dera Ismail Khan is an agricultural market center for wheat, millet, oilseeds, and gram. Cotton fabrics are woven and a fine inlaid woodwork is made. Pop. (1951) 41,663.

DERBENT, city, U.S.S.R., the Russian Soviet Federated Socialist Republic, in the Dagestan Autonomous Soviet Socialist Republic, on the W coast of the Caspian Sea and on the Baku-Rostov rail line; 150 miles NW of Baku. Derbent is a center for oil fields, has nitrogen-fixation and metalworking plants, woolen mills, canneries, and an important wine industry. Manufactures of silk and cotton textiles, pottery making, asphalt and reinforced concrete, and firearm production are other industries. Derbent was known as Bab-el-abwab until 550, and was part of the Persian Empire. The remains of a line of fortifications of the sixth century, known as the Caucasian Wall, are an interesting feature. Derbent was seized in 1220 by the Mongols. In 1722 it was taken from Persia by Peter the Great of Russia, but given back to Persia in 1735. It was again conquered by the Russians in 1796 and annexed to Russia. Pop. (1950 est.) 35,000.

DERBY, EDWARD GEORGE GEOFFREY SMITH STANLEY, 14th **EARL OF,** 1779–1869, British political leader, was born in Knowsley, Lancashire. Appointed secretary for Ireland, 1830, Derby supported the Reform Bill and secured passage of the first national education bill. As colonial secretary, 1833, his brilliant oratory helped put through a bill to free the slaves in the West Indies. Leader of the protectionist Conservatives after 1844, he was prime minister in 1852, in 1858–59, and in 1866–68. With Benjamin Disraeli, Derby led support of the Reform Bill of 1867. A classical scholar, Derby translated the *Iliad* into blank verse in 1864.

DERBY, GEORGE HORATIO, pseudonym John Phoenix (nickname Squibob), 1823–61, U.S. soldier and humorist, was born in Dedham, Mass. After serving with distinction in the Mexican War, Derby contributed humorous sketches to newspapers and magazines. His works were collected as *Phoenixiana* (1855) and *The Squibob Papers* (1859).

DERBY, city, SW Connecticut, New Haven County, on the Housatonic and the Naugatuck rivers and the New York, New Haven, and Hartford Railroad; 8 miles W of New Haven. Primarily an industrial city, Derby has manufactures of textiles, machinery, tools, rubber products, wire and metal products, chemicals, and automobile and airplane parts. The first settlement here was a trading post located on land purchased from the Paugasuck Indians. In 1675, the colony was made a separate township and named for Derby, England. Pop. (1950) 10,259.

DERBY, county borough, central England, county town of Derbyshire, on the Derwent River, 34 miles NNE of Birmingham. Derby is an important railroad junction and industrial center. Industries in the city include the manufacture of Rolls Royce automobiles and aircraft engines, railroad equipment, electrical equipment, chemicals, pottery, leather, and textiles. Derby contains several notable old buildings, including an early sixteenth century church. The first successful English silk mill was established at Derby in 1717. Pop. (1951) 141,264.

DERBY, ENGLISH, famous horse race for three-year-olds, known in England as Epsom's Derby. The race was instituted in 1780 by the 12th Earl of Derby at Epsom Downs, near London, and annually draws hundreds of thousands of spectators. The event was held at Newmarket during World Wars I and II, and through error was run on a left-hand track measuring 1 mile 881 yards instead of 1½ miles.

DERBY, KENTUCKY, the most famous American prep race for three-year-old horses, held early in May each year at Churchill Downs, Louisville, Ky. Modeled after the English Derby, the first Kentucky Derby was run on May 17, 1875, over 1½ miles, which was subsequently shortened in 1896 to the present 1¼-mile route. Credit for the modern Derby's popularity is usually accorded Col. Matt Winn, manager of the track from 1902 to 1949. Contrasted with the original purse of $2850 won by Aristides in 1875 was the record $123,450 won by Needles in the 1956 running; fastest time for the Derby was the 2:01⅖ established by Whirlaway in 1941. Other famous horses winning the run were Twenty Grand (1931), Cavalcade (1934), War Ad-

COMMONWEALTH OF KENTUCKY, DIVISION OF PUBLICITY

Exercise boys warm up starters prior to the running of a Kentucky Derby at Churchill Downs, Louisville.

miral (1937), Citation (1948), and Swaps, 1955. Outstanding jockeys in the history of the classic were Eddie Arcaro, with five victories, and Isaac Murphy and Earl Sande with three each.

DERBYSHIRE, county, central England, bounded by Yorkshire on the N, Nottinghamshire on the E, Leicestershire on the SE, Staffordshire on the W, and Cheshire on the W and N; area 1006 sq. mi.; pop. (1951) 826,336. Northern and central Derbyshire consists of the southern extremity of the Pennine Chain, here known as The Peak. Elevations above 2000 feet occur in The Peak and there are extensive moorlands. The southern part of the county is made up of level or rolling country. The Derwent, Dove, and Trent are the principal rivers. Crop raising is largely confined to southern Derbyshire with fodder, wheat, barley, and potatoes the principal products. Cattle and sheep raising is generally important, particularly in the upland sections of the county. Coal and lead are the main mineral resources. Industry is concentrated in the larger urban centers. Leading manufactures are textiles, automobiles, aircraft engines, machinery, leather, pottery, metal products, and chemicals. Derby is the county town. Other major centers are Alfreton, Chesterfield, Glossop, Ilkeston, Long Eaton, and Swadlincote. Bakewell, Buxton, and Matlock are spa resorts. Derbyshire, particularly the northern and central portions, is noted for its great scenic beauty. The valley of the Dove River, or Dovedale, is especially well known. The county has numerous prehistoric remains, Roman relics medieval castles, and manor houses, including Chatsworth, the ancestral home of the dukes of Devonshire.

Location Map of Derbyshire

DERELICT, a vessel or part of a vessel or its cargo abandoned at sea by the master and crew without the intention of returning to it or the hope of recovering it; also any other personal property abandoned or cast away on land or sea, or land uncovered by receding waters when the bed or course is changing. Goods become derelict by the intention of the owner, not by time alone, no matter how long they may have been outside his possession. See SALVAGE; TREASURE-TROVE.

DERG, LOUGH, lake, W Ireland, in counties Galway, Clare, and Tipperary, formed by an expansion of the Shannon River. Lough Derg has an irregular shape and is about 23 miles long with a width of from 1 to 5 miles. The many small islands include Holy Island or Iniscaltra, which has medieval ruins. The name is also given to a smaller lake in southern County Donegal, northwestern Ireland.

DE RIDDER, city, SW Louisiana, parish seat of Beauregard Parish, on the Kansas City Southern, the Santa Fe, and the Southern Pacific railroads and U.S. highways 171 and 190; 62 miles SW of Alexandria. The principal industries are lumbering and the manufacture of lumber and cottonseed products and naval stores. Pop. (1950) 5799.

DERIVATIVE. See CALCULUS.

DERLETH, AUGUST WILLIAM, 1909– , U.S. poet, critic, novelist, and journalist, was born in Sauk City, Wis., and was educated at the University of Wisconsin. His most ambitious literary project was the "Sac Prairie" saga, a fictionalized account of life in a typical midwestern town (his own Sauk City) from 1830 on; of the projected 50 volumes about 25 had been published by 1956. The first book in the series was *Wind Over Wisconsin* (1938), followed by several volumes of poetry, novels, and journals. Derleth also edited numerous volumes of science fiction and wrote several mystery stories, such as *Fell Purpose* (1953). Among his many books of poetry was *And You, Thoreau!* (1944). A novel, *From the Land of the Sky-Blue Waters*, appeared in 1955.

DERMATITIS, an inflammation of the skin that can be caused by many different agents. It may terminate in a few days or continue as a chronic condition for years. Exposure to certain substances may produce some types of dermatitis; emotional and psychic upsets, or occupational, environmental,

or climatic factors may cause others. See Psychosomatic Medicine; Occupational Disease.

Inflammations of the skin are characterized by mild to very severe burning or itching. Areas of inflammation may appear anywhere on the body but are most common on the back of the hands, on the feet, arms, legs, face, neck, and other exposed parts. Moist areas such as the groin and armpits are also common sites. In acute stages of the inflammation the involved areas are red and swollen, and blisters and crusts may form; in chronic cases the skin becomes hard, dry, leathery, and darkened.

Contact dermatitis is an irritation of the skin resulting from contact with a substance to which the skin is sensitive. Many substances may produce this type of dermatitis. Even such common substances as soaps, powders, drugs, dyes, and fabrics will cause inflammatory reactions in a sensitive skin. For example, dermatitis on the neck may result from a sensitivity to scarves, neckties, or the dye in a shirt. One form of contact dermatitis is the inflammatory reaction to such plants as poison oak and poison ivy. See Poison Ivy; Poisonous Plant; Poison Oak; Poison Sumac.

Atopic dermatitis, often chronic and difficult to manage, is frequently associated with other allergic manifestations such as hay fever or asthma. Contact agents are seldom the cause; not infrequently some element in the diet will occasion the inflammation. Eczematous conditions frequently arise in combination with other skin or systemic diseases. See Eczema.

Treatment of dermatitis depends entirely on discovering and removing the causative agent. Patch tests are often used to determine the agent; in such tests a small amount of the suspected substance is placed on the skin and if a rash develops the test substance is considered the offending agent. Scratch tests are also used; in these a scratch is made in the skin and the suspected substance is placed in the scratch. The scratches around which redness, swelling, or rash occur indicate the offending agents. Only removal of the causative agent will effect a cure.

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DERMATOLOGY, the medical science dealing with the skin and its diseases. See Skin, Skin Diseases.

DERMATOSIS. See Dermatitis; Skin, Skin Diseases.

DERMESTES, a genus of highly destructive beetles belonging to the family *Dermestidae* (see Beetle). The larder beetle, or bacon beetle, *D. lardarius*, is about one-fourth inch in length. Its color is dark except for the fore part of the elytra (wing covers), which are light brown. The antennae are short and clubbed, the mouth parts adapted for chewing. The thick-bodied larva is covered with dark brown hair. This insect is especially harmful to stored meats and cheese, although it will eat any animal product.

DERMOID TUMOR. See Tumor.

DERN, GEORGE HENRY, 1872–1936, U.S. cabinet officer, was born in Dodge County, Neb. He was secretary of war under Pres. Franklin Delano Roosevelt, 1933–36.

DERNA, town, NE Libya, in the province of Cyrenaica, on the Mediterranean Sea, 150 miles ENE of Bengazi. Derna is a seaport and the commercial center of a fertile oasis producing cereals, dates, fruits, and olives. Industries include the manufacture of food products, construction materials, and metal goods. The town was briefly occupied by U.S. naval forces in 1805 during action against the North African pirates. Pop. (1950 est.) 22,000.

DERNE EXPEDITION. See Eaton, William.

DERRICK, a hoisting apparatus characterized by a central mast or tower supporting the elements that lift and move loads. Some derricks, like some cranes, rotate on their bases, but differ from cranes in that they have fixed positions. The masts of the rotary types are supported by guy wires or backstays and are often built in such a way that they can easily be taken down and set up again. See Crane.

Rotary Derricks. Guy derricks have a pivoted vertical mast, held in position by five or more wire-rope guys radiating from its top to anchorages, and an inclined boom hinged to the base of the mast so it can move vertically. The boom is raised and lowered by a wire rope (called a boom-line) run through a pulley at its free end, thence through a guide pulley at the top of the mast, through another guide pulley at the base of the mast, and finally to a hoist drum. Loads are raised by another rope (called a load line) run through a hook block suspended from the boom end, up through a pulley at the boom end, along the boom to pulleys at the mast, and finally to another hoist drum (see Block and Tackle; Hoist). Winding in the boom line elevates the boom and reeling in the load line raises the load. Guy derricks are often used to set steel in place in multistoried building construction. Stiff-leg derricks are similar to guy derricks but differ in their bracing, the mast being held upright by two inclined struts ("stiff legs") extending from its top to the ground. These legs are set at a 90-degree angle to each other and obstruct the rotation of the mast and boom, so the derrick can describe only about three-fourths of a circle. Both types are built of either timber or steel, and both are simple and easily dismantled. Typical uses include quarry work, train and truck unloading, and marine construction and salvage work.

Fixed-Base Derricks. These are pyramidal four-legged steel towers used in drilling deep wells for oil, gas, and water. Centered over the hole, they support the drilling tools and handle the well casings. They are built on concrete footings and sometimes reach heights of 200 feet. Hoisting is done with lines running through the pulleys of a stationary block at the top of the derrick to a movable block farther down, which handles the load. Power is supplied by an engine and hoist located on a platform inside the derrick near its base. When the well is completed these derricks are often taken down and moved to a new site. See Drill; Petroleum, *Drilling*.

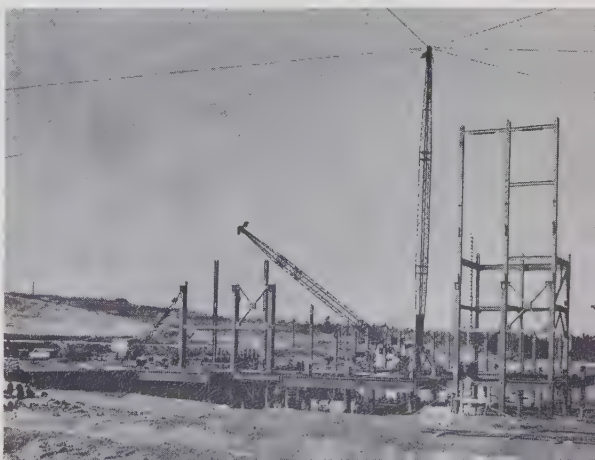
Edwin J. Knudsen

DERRIS, a genus of about 40 species of plants belonging to the pea family, *Leguminosae*. These plants are mostly climbing shrubs indigenous to the tropical forests of southeast Asia. The roots yield a poisonous substance, rotenone, an important ingredient in many insecticides.

DERRY, town, SE New Hampshire, Rockingham County, on the Boston and Maine Railroad; 10 miles

A steel guy derrick hoists steel into place on a building construction job. Such derricks are particularly useful where large area coverage is an important consideration.

CLYDE IRON WORKS



Dervishes, members of a Moslem religious order, perform whirling dances as part of their worship. Although Persian in origin, dervishes are found throughout Islamic lands.

SE of Manchester. Settlement was made in Derry about 1720 by Scotch-Irish settlers who introduced the linen making industry which flourished in the town until the beginning of the nineteenth century. Chief manufactures are shoes and textiles. Pop. (1950) 5826.

DERRY. See LONDONDERRY.

DERTONA. See TORTONA.

DERVISH, a Moslem devotee, usually member of an order or group, practicing piety, poverty, and often mendicancy. Though most dervishes are banded together in communities, some live solitary lives. There are a number of independent orders, each with its own rules and customs; often these are secret. Associated with the orders in many cases are laymen, as individuals or in societies, desiring to live better according to the law of Islam. European observers have stressed the practices of the so-called whirling dervishes, whose ritual includes a dance which grows wilder and more rapid, and the howling dervishes, whose prayers and chants grow louder and more frenzied. These groups and others known to cut and otherwise injure themselves are exceptional and not characteristic. Dervishes or men of similar character are found throughout Islamic lands. Dervish is a Persian word; the Arabic word *fakir*, or *faqir*, is used especially in India and Pakistan, sometimes of Hindu as well as Moslem holy men; *marabout* is common in North Africa. See also MOHAMMED, Islam.

DERWENT RIVER, NE England, E Yorkshire, rises in the North York Moors, 10 miles NW of Scarborough and flows S, W, and S to join the Ouse River 5 miles SE of Selby. The river has a total length of 60 miles and flows through rich farm land.

DERWENT RIVER, S Tasmania, rises in Lake St. Clair and flows SE for a course of about 107 miles into Storm Bay, an inlet of the Tasman Sea. It is navigable from the port of Hobart inland to New Norfolk.

DERWENTWATER, or Keswick Lake, NW England, S Cumberland, on the Derwent River. Derwentwater is roughly oval in shape with a length of 3 miles from north to south and a width of 1 mile from east to west. The lake contains wooded islets and occupies a picturesque location among mountains. North of Derwentwater are Keswick, a resort center, and the famed Falls of Lodore.

DERZHAVIN, GAVRIIL ROMANOVICH, 1743–1816, Russian lyric poet, was born in Kazan. An enthusiastic admirer of Empress Catherine II, he was her poet laureate, her governor of Olonetz, and later her secretary. He also held posts under Emperor Paul I and Emperor Alexander I. He was regarded as the greatest Russian poet before Alexander Pushkin. Derzhavin's best known work is *Oda Bog*, 1784 (*Ode to God*, 1861); he also wrote *Monody on Prince Mestcherski* and *The Taking of Warsaw*.

DES. See DEJ.

DESAGUADERO RIVER, W Bolivia, in the departments of La Paz and Oruro, forming the outlet of Lake Titicaca near Guaqui, and flowing generally SE to enter Lake Poopó. The Desaguadero River has a total length of about 200 miles and flows across part of the Altiplano, or high plateau, of Bolivia. Its principal tributary is the Mauri River.

DESAIX DE VEYGOUX, LOUIS CHARLES ANTOINE, 1768–1800, French general, was born in Saint-Hilaire-d'Ayat. After distinguished service in Germany and in Italy, Desaix fought with Napoleon Bonaparte in the Battle of the Pyramids, and conquered Upper Egypt, 1798–99. His administration prompted the Arabs to call him The Just Sultan. Rejoining Bonaparte in Italy, Desaix turned apparent defeat into victory by his brilliant attack at Marengo on June 14, 1800, but was killed during the battle.

DESALTING, the chemical removal of salt from water to make the water useful for drinking and other purposes. It is accomplished by ion-exchange materials selected for the specific need (see ION EXCHANGE). Salty water can be made as pure as distilled water; the process, however, is not economically competitive with distillation (see DISTILLATION). Emergency desalting equipment has been developed by the U.S. armed forces to convert sea water into drinkable water for men who have been shipwrecked or forced down at sea. The equipment is provided in lifeboats, life rafts, and survival kits.

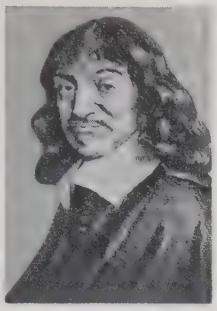
DE SANCTIS, FRANCESCO, 1817–83, Italian literary critic, educator, and patriot, was born in Morra Irpina, Avellino. An anti-romantic, he encouraged students of his private school of literary studies to participate in the life around them; he followed his own advice and was long active in the complicated and bloody struggle for Italian unification and independence. He resigned a professorship of literature at Zurich to become governor of Avellino province (appointed by Garibaldi) in 1860, and later served as minister of education, 1861 and 1878–81. Apart from his political writings and activities, De Sanctis was in large measure the founder of modern literary criticism in Italy, favoring a synthetical (as opposed to analytical) method. His most important works in this vein are *Saggi Critici* (1881), *Storia della Letteratura Italiana* (1871), *Nuovi Saggi Critici* (1872), and *La Letteratura Italiana nel Secolo* XIX (1897).

DESBARRES, JOSEPH FREDERICK WALLET or **WALSH,** 1722–1824, English military engineer and hydrographer of Huguenot parentage, was aide to Gen. James Wolfe, who was killed in 1759 during the siege of Quebec. After 1763 Desbarres made surveys in the British colonies and charted the coast of North America, publishing these charts as *Atlantic Neptune* (1777).

DESCARTES, RENÉ, 1596–1650, latinized "Cartesius" against his will, was called the father of modern philosophy by Schopenhauer. Descartes was characterized by La Fontaine as "this mortal of whom former ages would have made a god and who holds midway between Man and Pure Spirit." Descartes enriched mathematics, physics, metaphysics, medicine, and technology; he created analytic geometry. But more important was the fact that he showed that society should make organized scientific research an essential part of its way of life. He gave the Western world its good conscience in such activity. "He nearly dominates the French mentality, France's civilization, her literature, and her language," wrote Eduard Beneš.

Life. Descartes' father held office in the parliament of Rennes, France, but the well-to-do family came from La Haye, Touraine, where Descartes was born. His mother died when he was one year old and rarely has such a loss played such a great role in the life of the human mind as in this case. At 19 he graduated from the new, ambitious college La Flèche of the Jesuit order and embarked upon the traveling life of a young cavalier. A trip to Holland in 1618 gave Descartes a new friend, Isaac Beeckman (eight years

his senior), with whom Descartes agreed to proceed by a method in which physics and mathematics should go hand in hand. Descartes' mind was geometrical and he improved this field, invented index notation, and found that his analytic geometry could solve "an unlimited number of problems if he assumed that the solution already was known."



René Descartes

Although Descartes joined the French army marching through Germany, he remained preoccupied with his geometrical success. While billeted near Ulm in a well heated room on Nov. 10, 1619, he had his famous dream (actually three dreams) in which he was told that an "admirable science" would chain together all particular sciences into a single order and that he would have the enthusiasm to carry this revelation to fruition. Overjoyed, he vowed a pilgrimage to Our Lady of San Loretto. Descartes' joy and certainty did not immediately lead him to a change of life. He traveled in Bohemia, Hungary, Switzerland, and Italy, and from 1625 to 1628 lived in Paris. Warned by the Cardinal Pierre de Bérulle that realization of his extraordinary gift would require faithful service, Descartes gave up his cavalier existence in Paris and from 1628 to 1649 lived in no less than 13 different Dutch cities while working on his system. Although he never taught, Descartes kept in touch with the scientific world through correspondence; 138 letters written to Marin Mersenne (1588–1648), who acted as the scientific journal in those days, have been preserved. Descartes never married, since the doctors had not given him long to live, but he was not insensible to joy and grief: in 1635 a servant girl bore him a daughter and when the child (who had been baptized a Protestant) died in 1640 the Catholic Descartes was deeply distressed.

In 1649 Dutch antagonists made his life less pleasant in that country; at the same time civil war threatened in France. Queen Christina of Sweden, who already was his correspondent and hoped to found an academy of science in Stockholm, prevailed upon him to transfer to her court. In her zeal for learning, the queen asked for instructions from him three times a week at five o'clock in the morning; three weeks of this regime brought on pneumonia, and within nine more days Descartes was dead. His remains rest in Saint-Germain-des Près in Paris.

Doctrine. Descartes wrote on many disparate subjects, but all his writings were not of equal importance. Before Galileo was condemned by the Church, Descartes expected to win over the Jesuits and the public with his physics; after Galileo's trial Descartes dropped this plan and put the metaphysics first on his timetable. These maneuvers had little real influence on his ultimate purpose—to conquer with a method of research. To this goal he subordinated everything else.

Descartes said of himself that he wore a mask and, although his doctrine was in fact quite revolutionary, he diplomatically avoided open conflict with the other scholars of his time, most of whom were teachers content to repeat with but slight variations the ideas and ways of thought hallowed by many centuries of use. Indeed, Descartes was at some pains to point out that he had no desire to controvert the old ideas; moreover he avoided teaching as much as possible; instead he desired to live the life of pure mind, and "*Cogito, ergo sum*" (I think, therefore I am) was his proud motto.

The scholastic teachers were accustomed to begin with the assumption of God or of Nature: God (or Nature) exists, therefore this and that must follow. Descartes would have none of this, but looked to his own mind as the starting point. Amid the innumerable stimuli, sensations, memories of mind, he asked, what can I regard as certain? His answer was radical, but he hoped that others would not notice just how radical it was. Motherless, Descartes had been the product of an ambitious boarding school which had tried to smother his mathematical genius with scholastic book learning; it was not entirely surprising, therefore, that he decided that everything he had learned, believed, felt, or hoped in the first 20 years of his life was at best uncertain, at worst mere nonsense. He concluded that only those propositions are certain which can be communicated perfectly from mind to mind, that is, things demonstrable through mathematical deduction or by the immediate evidence of experimental repetition. What actually was Descartes' "first mind"—the poetical, religious, affectionate, and loyal impressions of youth—he dismissed as naive. His "second mind," critical, reflective, and generalizing, he insisted on calling his "prima philosophia," the title of one of his books, *Prima Philosophia* (1641). He considered memories of his first 20 years as clogging his mind. He wished to free his mind from such incumbrances. Obviously if the human mind was to be the starting point of philosophical and scientific research, it must be universalized to a stature comparable with previous starting points, such as God and Nature. Therefore all personal singularity must be stripped away and abandoned. Accordingly Descartes humbly removed from his conception of his own mind all of its sparkling genius, its creative originality; the dregs that were left, the indifferent and transferable intelligence, he called the mind. Those mental qualities or actions which do not have to do with these dregs Descartes considered less valuable and less rational. The lasting effect of this arbitrary division between his "first" and his "second" mind was that thereafter the second mind was mistaken for the mind in general. See EXISTENTIALISM.

Descartes (and his followers into the twentieth century) viewed his own youthful vitality, and birds, mammals, flowers, and trees as well, as mere machines, which now or later would be reduced to mathematical explanation: beneath their higher selves (that is, in Nature) Cartesians recognize mechanisms only. Moreover, God was also made dependent upon the human mind's own certainty, for Descartes taught that God's existence could be proved solely by the fact that the mind is able to think of a perfect being, and since one necessary attribute of a perfect being would be its existence, God exists because the mind says so!

The Cartesian starting point (*Cogito, ergo sum*) implied that all sense data could be reduced by mathematical deduction to mere extendedness of moving particles in space. While Descartes promised mastery of the physical universe, the price to be paid for this mastery was that the body lose its significance for the fulfillment of the soul's destiny. The fact that Descartes separated body and soul into two separate substances has always been felt to be the weakest point in his system. However, if he is read as the advocate of the new enterprise of organized research, then his neglect (even denial) of the unity of body and soul seems to have been largely of a tactical nature—a way of winning acceptance for the idea of free research. The lasting merit of Descartes' method is the very fact that doubt is its first breath. But this doubt is not a permanent doubt of the whole universe, after the manner of the skeptics and cynics. Descartes introduced the method of intermittent, yet perpetual, doubt of every individual detail.

As Descartes isolated space, he completely misunderstood time. He said that God seemed to recreate time afresh every second, since otherwise time would seem inexplicable. But the anti-Cartesian movement of the twentieth century recognized that time was wronged by the Cartesians. It was more and more realized that time is as much deserving of its own science as space, perhaps more so.

The question of the relation of his own limited lifetime to history Descartes solved by his "provisional morality." The scientist (he wrote) with his life dedicated to research, and having to doubt every proposition in the course of this research, must not doubt in matters of religion and government, since only after centuries will these topics be covered by the admirable new science. In the meantime, all scientists have to remain law-abiding citizens of church as well as state. As scientists, the mind is free to doubt, but social and political actions must enact the existing order. That Descartes held such a view suggests why he was more successful in wedging scientific research into the structure of society than were many more vehement spirits. In Descartes were united a conservative Christian, a loyal citizen, a mathematical genius, and a bold innovator. It will not do to treat him as a mere opportunist, hypocrite, or coward. However his tactics may have changed, his goal remained the same, and he devoted his energies to one task only: convincing people that they should begin to investigate by his method.

His "heroic pioneering in utopia" (B. Bauer's apt phrase) bore fruit. During Descartes' early years an enormous skepticism undermined the medieval traditions based on Aristotelian book knowledge. By the end of Descartes' life both the book learning from Aristotle and the crude empiricism of Aristotle's enemies were giving way to regulated progress in the sciences: (1) a theory (mostly mathematically conceived); (2) experiments construed to test this theory; (3) correction of the theory and the experiments until theory and experiment are congruous; (4) technical application of the new harmony.

Descartes' Works. His most famous book, *Discourse on Method*, published anonymously in 1637 in the French tongue, was the first to be put in print. His earlier manuscripts and the letters were collected (in a classical edition in memory of the tercentenary of his birth) by Charles Adam and Paul Tannery (12 vols. 1896–1912); this definitive edition also included the books edited after 1637 by Descartes himself as the *Prima Philosophia* (1641), *Principia Philosophiae* (1644), and *Passions of the Soul* (1649), the last named a work written for the young Princess Elizabeth of Holland. A careful translation of all his work, by E. S. Haldane and by R. T. Ross (2 vols. 1911–12), is available in English. See Philosophy. Eugen Rosenstock-Huessy

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DESCENT AND DISTRIBUTION is the method by which private property, both real and personal, passes by operation of law to heirs and next of kin when the owner dies intestate. Realty is said to descend and personalty to be distributed. If the intestate leaves no heirs the property escheats, that is, reverts to the sovereign or state; eventually it is sold and, according to the most prevalent practice, the proceeds are turned over to the educational fund of the county or counties having jurisdiction.

The intestate's widow's half of community property in those eight states (Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, and Washington) in which that system obtains is not subject to the law of descent and distribution. The political units which have jurisdiction of realty and personalty are, respectively, the county in which the land lies and the county of which the intestate was a resident at the time of his death.

DESCHAMPS, EUSTACHE, 1346?–?1406, French court poet, was born in Vertus, Champagne (later Châlons-sur-Marne). He was a pupil of the poet Guillaume de Machaut, by whom he was brought up, and was a figure at court after 1368. He held various minor posts under Charles V and took part in several missions abroad. He wrote 1175 *ballades* (one of them addressed to Chaucer), in which he brought this complex form to a high state of development—at least technically—and more than 200 short pieces in the *rondeaux* and *virelais* forms. Of less importance is his *Miroir de mariage*, a long (over 12,000 verses) satire against women. He also wrote the first French "ars poetica," *L'Art de dicter* (1392). His work is marred by an overemphasis on technique and a didactic tone. *Oeuvres complètes*, edited by Saint-Hilaire and Raynand in 11 volumes, appeared, 1878–1904.

DESCHANEL, PAUL EUGÈNE LOUIS, 1856–1922, French author and tenth president of the Republic, was born in Brussels, Belgium, the son of Émile Deschanel (1819–1904), French author and critic, who was in exile at the time of Paul's birth. Paul Deschanel was in the chamber of deputies after 1885. A leader of the Progressive Republican party, he called for separation of church and state. He was president of the chamber of deputies in 1898–1902 and in 1912–20. Elected president of the French Republic in January 1920, Deschanel resigned in September of the same year because of ill health. A member of the French Academy, he wrote *Orateurs et hommes d'état* (1888), *La Question sociale* (1898), and *Gambetta* (1920).

DESCHUTES RIVER, N Oregon, rises in the Cascade Range, flows generally N for its course of about 250 miles, joining the Columbia River 14 miles E of The Dalles. The river is used for irrigation and power. See Columbia River.

DESCRIPTIVE GEOMETRY, a method of representing and solving space, or three-dimensional, problems by means of lines and points drawn on a plane, or two-dimensional surface. The principles of descriptive geometry form the basic theory underlying the more common means of graphical expression used by engineers and architects to prepare drawings for the instruction of workmen. The principles also include those of design. Thus, descriptive geometry is graphical mathematics and can be used to obtain numerical results that would otherwise be found by means of analytic geometry. See Analytic Geometry.

Descriptive geometry is particularly applicable to the study of those curved surfaces which can be formed by bending a plane surface without tearing, crumpling, or stretching. Such surfaces are called developable surfaces. A cone or stove pipe is developable whereas a sphere is not. A typical problem involving developable surfaces would be that of finding the shape of a plane surface which when properly bent or rolled would form a teapot.

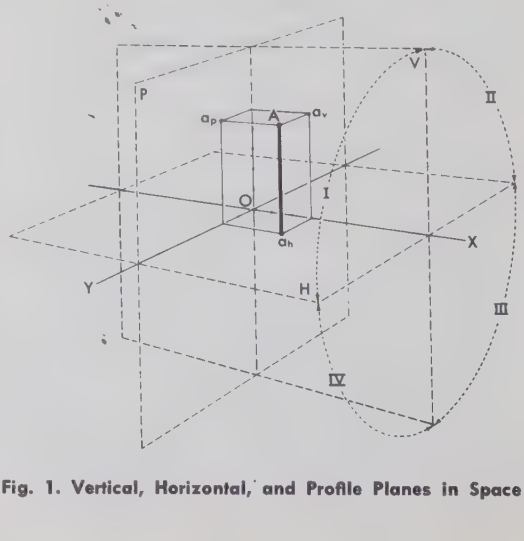

Fig. 1. Vertical, Horizontal, and Profile Planes in Space

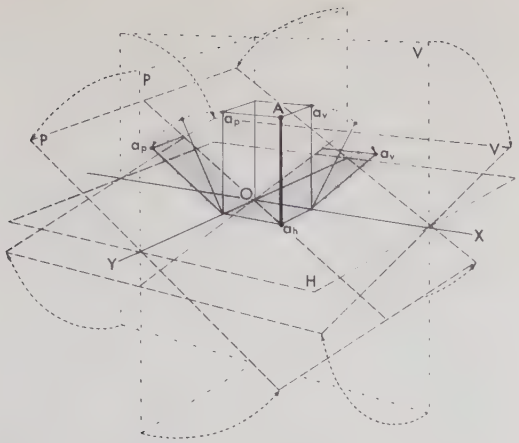

Fig. 2. Rotation of the *V* and *P* Planes into the *H* Plane

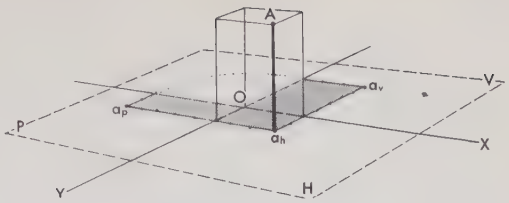

Fig. 3. A Plane Drawing Showing the *V*, P, and *H* Views

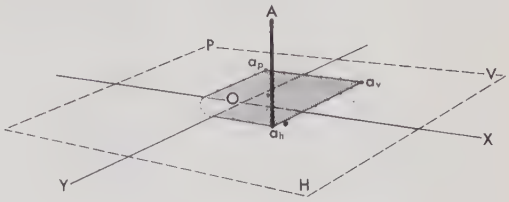

Fig. 4. Result of Rotating *P* into *V* and Both into Plane *H*

Artists intuitively use perspective projection in drawing irregular shapes, and occasionally may resort to mechanical methods based upon theories of perspective projection, when the shapes depicted contain many straight line elements. A simple method of visualizing perspective projection can be demonstrated if one stands a little less than arm's length away from a windowpane and looks through it at some object such as a house across the street. A mark is placed where the line of sight to one corner of the house appears to pierce the windowpane. Without changing position one then places another mark for the piercing point of the line of sight from another corner. A line connecting these two marks is a perspective view of the line between the same two points on the house. The connection of a number of points in a similar manner will build up a perspective view of the house.

Descriptive geometry is based on the idea that a point in space is completely specified by three mutually perpendicular distances measured from three mutually perpendicular planes, and that if two of these planes are properly rotated into the plane of the third the three distances will appear in true length if drawn to a suitable scale.

For example, Fig. 1 shows three mutually perpendicular planes marked, *H*, *V*, and *P*. The horizontal plane is represented by *H*, the vertical plane by *V* and the profile plane by *P*. The three planes intersect at a common point, or origin, *O*, and are considered to extend indefinitely. The horizontal and vertical planes divide space into four quadrants, marked I, II, III, and IV, when viewed by an eye in the position shown. Suppose a point, *A* is placed in the first quadrant by moving it from the origin *O* three units to the right, two units forward, and five units vertically. If from point *A* perpendiculars are drawn to the vertical and profile planes, they will pierce the planes at a_v and a_p respectively. These points have the same vertical distance from the horizontal as point *A*. A perpendicular drawn from *A* will pierce the horizontal plane at a_h, which is as far forward from *V*, and as far to the right of *P*, as is point *A*. (To distinguish between *A* and *a*, the small letter refers to the projected view and the capital letter to the object itself.)

When the *V* plane is rotated on the *X* axis into the plane of *H*, as shown in Fig. 2, a_v will come to rest in the plane of *H* on a line perpendicular to the reference line *OX* and passing through a_h. (See COORDINATE.) In a similar manner the *P* plane may be rotated into the plane of *H* about the reference line *OY*, and a_p ultimately will come to rest on a line passing through a_h and perpendicular to *OY*. Figure 3 is a plane drawing that shows the relationship between the three views resulting from completely rotating the profile and vertical planes into the horizontal. Proper interpretation of these views completely specifies the location of a point *A* in space with respect to the origin *O*. To locate a single point, it is necessary only to have any two of the projected views of that point, such as a_v, a_h, or a_p. A drawing such as Fig. 3, but with the profile plane rotated first into the vertical plane, and then with it into the horizontal plane (see Fig. 4), produces what the architect calls a plan view, a_h; a front elevation, a_v; and a left side elevation, a_p. The plane drawing resulting in either case is a first angle projection, when the point, or object, is placed in the first quadrant. Third angle projection is universally used in the United States for conventional engineering drawings.

In the case of an object other than a point, the projecting lines to the planes of projection are drawn from points on the faces of the object nearest the eye. This case is illustrated in Fig. 5, which is a third angle projection of an object. In this example an auxiliary profile plane *P* has been placed to the right of the object, a horizontal plane *H* over the top of the object, and a vertical plane *V* in front of the object. An additional auxiliary plane, labeled 1 is placed parallel to the object's triangular area *ABC* to show the true size and shape of the surface, which is not parallel to any of the principal planes.

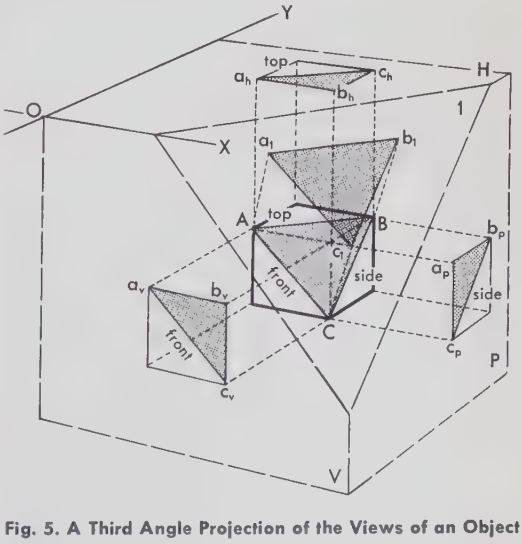

Fig. 5. A Third Angle Projection of the Views of an Object

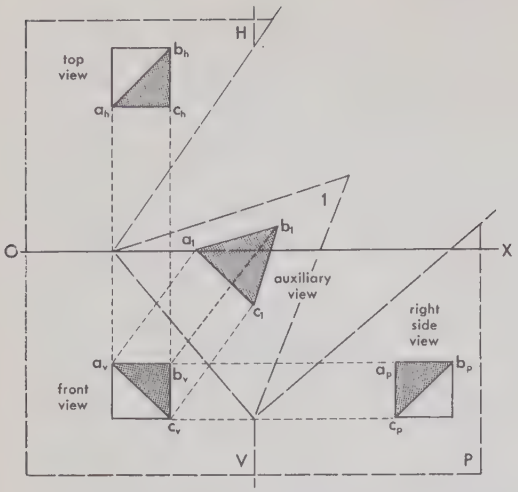

Fig. 6. A Plane Drawing of the Projection of an Object

There is no theoretical limit to the number of auxiliary planes that may be used, and in bringing them into the single plane of *H*, *V*, and *P*, they may be rotated about any line of intersection with any of the other planes. The lines *OY* and *OX* serve as reference lines on plane drawings to indicate the intersection of the planes of projection and enable one to determine the distance of the object from the various planes. This is illustrated in Fig. 6, which is a plane drawing resulting from the projections of Fig. 5. The views of the object are labeled as is customary, that is, top, front, right side, and auxiliary view. The four views of the object in Fig. 6 are the same as if one looked through the horizontal plane at the top of the object, the vertical plane at the front of the object, the profile plane at the side of the object, and perpendicularly through the auxiliary plane. When looking at any one view, such as the front for example, the reference line above it is considered as the edge of the horizontal plane, the one to the right as the edge of the profile plane, and the one at an angle as the edge of the auxiliary plane. The distance from the reference line *OX* to a point on the view, such as a_v, is equal to the distance from point *A* on the object to the perpendicular plane of which *OX* is considered the edge. To determine the true length of a line, therefore, auxiliary planes perpendicular to one of the principal planes are often constructed. An example of how this method is used is illustrated in Fig. 7a which represents two views of a line *AB*. Fig. 7b is a pictorial representation of this line suspended in space. To obtain the true length of this line, first of all a reference line *mn* is drawn parallel to $a_v b_v$ as shown in Fig. 7c. Perpendicular to *mn* are drawn two additional lines which pass through a_v and b_v respectively. The line *mn* can now be considered as the perpendicular intersection of an auxiliary plane 1 (see Fig. 7b) with the vertical plane *V*. Therefore, the line *AB* will be everywhere equidistant from the auxiliary and its projection on the plane will be its true length. A projecting line dropped from point *A* on the line to the auxiliary plane 1 will pierce the plane at a point a_1, as far behind *V* as a_h is from *V*. This corresponding distance is marked *r* in Fig. 7c. If the same distance marked *r'* is laid off on the line perpendicular to *mn* (Fig. 7c), point a_1 can be located. A similar method is used to determine the distance *p* and the location of point b_1. By connecting a_1 and b_1 with a line, the auxiliary projection of *AB* is obtained, which is the true length of the line, since the auxiliary plane was constructed parallel to *AB* for that purpose. Thus, any line will always show true length when projected on a parallel plane.

Descriptive geometry methods for solving problems dealing with shapes are merely an extension of the basic ideas illustrated using points and lines, since these are the elements of which shapes are constructed. Some of these problems consist of finding the lines of intersection of pipes and odd shaped surfaces, the development of sheet metal patterns that will form into desired shapes, the determination of the clearances between the members of a structure, or the parts of a device, and the lines of intersection of plane surfaces, and the shadows cast by architectural elements. See Mechanical Drawing; Analytic Geometry; Geometry.

ARTHUR W. HERSHEY

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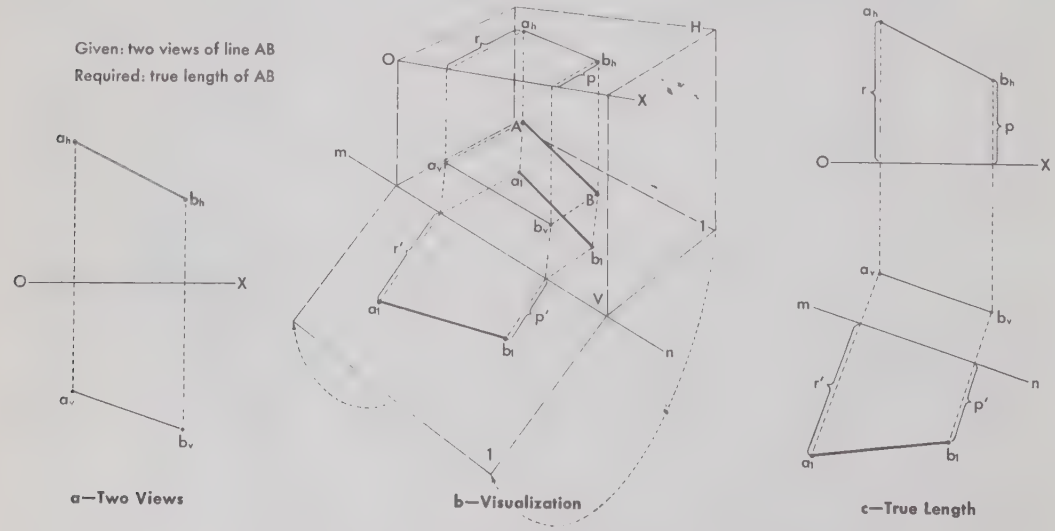


Fig. 7. Three Steps in Determining the True Length of the Line *AB*

DESEADO RIVER, S Argentina, in Chubut and Santa Cruz, rises in the Andes Mountains of SW Chubut, and flows E, NE, and ESE to the Atlantic Ocean at Puerto Deseado. The river has a total length of about 375 miles and forms most of the border between Chubut and Santa Cruz. The lower reaches of the Deseado are navigable for small vessels.

DESEGREGATION, a political theory that the separation of Caucasian and Negro races as traditionally practiced in the southern United States is in conflict with the concepts of equal justice under law and equal protection of the laws.

In 1849 in the case of *Roberts* v. *The City of Boston* the Supreme Judicial Court of Massachusetts originated the "separate but equal" doctrine, holding that: "The general school committee of the city of Boston have power, under the constitution and laws of this commonwealth, to make provision for the instruction of colored children, in separate schools established exclusively for them, and to prohibit their attendance upon the other schools." The Massachusetts Supreme Judicial Court declared: "It is urged, that this maintenance of separate schools tends to deepen and perpetuate the odious distinction of caste, founded in a deep-rooted prejudice in public opinion. *This prejudice*, if it exists, *is not created by law*, *and*, probably *cannot be changed by law*. Whether this distinction and prejudice, existing in the opinion and feelings of the community, would not be as effectually fostered by compelling colored and white children to associate together in the same schools, may well be doubted." In 1896 in the case of *Plessy* v. *Ferguson* the Supreme Court of the United States, following Montesquieu's theory, adopted the "separate but equal" doctrine. [The French political philosopher Montesquieu, advocated that the mores of a people should be accorded equal weight with the statutes of a nation, in effect balancing tradition and law upon the scales of justice. The court held that it was a reasonable exercise of state police power to require, for the purpose of minimizing racial friction, that white and colored persons traveling by railway be assigned separate cars, provided that equal accommodations were furnished the two races. Three years later the U.S. Supreme Court in *Cummings* v. *City Board of Education* extended the rule to public school facilities.

In 1950 the U.S. Supreme Court in *Henderson* v. *United States* overruled the Plessy decision and on May 17, 1954, in *Brown* v. *Board of Education of Topeka*, reversed the Cummings decision. In the Brown decision Chief Justice Earl Warren declared for the court that colored schools could not be made equal to white schools because of the sense of inferiority engendered in segregated colored children. Southerners were quick to point out that if there were any sense of inferiority fostered because of segregation it was fostered in white children as well as colored because segregation laws in the southern states had universal application. It was just as illegal, they contended, for a white person to violate a segregation statute as it was for a Negro to do so. The states of the deep South indicated little disposition to comply with, or conform to, the Brown decision, being of the opinion that the U.S. Supreme Court had decided a political and not a legal question. At the same time some states were strengthening their segregation positions, others were putting desegregation into practice. H. N. M.

DESERET, a proposed state of the United States, embracing a vast area in the Southwest. Organized in 1849 by the Mormons, Deseret was refused admission in 1850; instead Congress created the Territory of Utah. See UTAH.

DESERT, land rendered barren or semibarren because of meager precipitation. Deserts are not only areas where evaporation exceeds precipitation; some cold regions with light precipitation and vegetation that is sparse because of low temperatures may be considered deserts. In general, deserts receive less than 10 inches of precipitation in an average year. Three major types are commonly recognized: hot, mid-latitude, and cold deserts.

Hot deserts, also known as tropical or low-latitude deserts, occur approximately between the latitudes 15° to 30° in both northern and southern hemispheres. Within these latitudes is a belt of descending, drying air that is unfavorable to the development of precipitation. The major hot deserts of the world are the Sahara and the Kalahari deserts of Africa, the deserts of Arabia, the Thar Desert of Pakistan and northwestern India, the Australian Desert (see AUSTRALIA), the Atacama Desert of northern Chile, and the Sonoran Desert of northwestern Mexico and southwestern United States.

Mid-latitude deserts occur in the interiors of large continental land masses far distant from the oceans, which are the principal source of atmospheric moisture. Asia, the largest continent, has the most extensive mid-latitude deserts, including the Gobi Desert. The interior of western North America contains vast arid areas in the Great Basin and Colorado Plateau regions.

The aridity of deserts may be intensified by the presence of mountains, which act as a barrier to rain-bearing winds. Such dry areas are said to be in the rain shadow of the mountains. The hot deserts are generally the most arid of the desert types. Portions of the Atacama Desert have had no rainfall for many years and much of the Sahara receives less than five inches of rain in an average year. Desert precipitation, although very scanty and unreliable over a long period of time, may fall in torrential downpours. Surface runoff in deserts is usually rapid, in the absence of a close vegetation cover, and the infrequent downpours may cause local flooding. Desert air generally has a low humidity; consequently skies are apt to be clear and sunshine is abundant. Because of the lack of cloud cover, the land surface of deserts heats up rapidly in sunshine but cools quickly at night causing a great daily range of temperature. Deserts tend to be windy and dusty as there is little vegetation to reduce air movement over the ground or to secure loose surface material. Hot deserts frequently experience sand storms or simooms (see SIMOOM). During the day the intense heat of deserts like the Sahara causes a shimmering haze which when viewed at a distance may create a mirage (see MIRAGE).

A camel caravan pauses for a brief rest among the dunes of the Sahara, the great desert of northern Africa that extends from the Atlantic Ocean to the valley of the Nile.
PHILIP GENDREAU

U.S. FIELD AND WILDLIFE SERVICE

Joshua trees are the predominant vegetation in this part of the Great American Desert near Las Vegas, Nevada.

Desert land forms differ markedly from those of humid areas and are characterized by angularity resulting from the relatively slow rate of rock weathering, the sparse vegetation cover, and the lack of vegetation protection against erosion, including vigorous water erosion after the rare cloudbursts. Wind erosion and deposition are important in shaping the desert land surface, which is made up mainly of bare rock, rock fragments, and sand. Sandy deserts, called ergs, have sand piled in dunes, which change their form and location under the influence of shifting winds (see DUNE). Desert streams generally contain water only immediately after rainfall. These streams are known as arroyos or wadies and are marked by steep-sided channels. Desert streams usually flow, not to the sea, but to basins of interior drainage where the excess water is lost by evaporation or seepage. The centers of such desert basins may contain salt deposits (playas or alkali flats) or saline lakes. Such saline areas are completely sterile but may yield economically valuable salts. A few rivers with sources in humid regions possess enough volume to cross deserts and flow to the sea. Notable examples are the Nile, the Tigris-Euphrates, the Indus, and the Colorado.

Completely barren deserts entirely without vegetation are rare. Most desert regions support some vegetation adapted to the dry environment. Certain desert plants are able to withstand long periods of drought because their thick leaves and stems store water. Commonly the leaves are very small and protected so as to reduce moisture losses caused by transpiration. Plants growing in deserts are usually low and widely spaced, with well developed root systems. Typical desert vegetation includes cacti, bunch grass, sagebrush, and creosote bush. Some desert plants are tolerant of ground containing a high proportion of alkali. The animals of deserts are generally small but surprisingly numerous. Reptiles are particularly common. True desert animals include the camel, gazelle, desert rabbit, kangaroo rat, and desert fox.

Cold deserts, or tundras, occur in the regions bordering the Arctic Ocean in North America, Europe, and Asia. Climatic conditions similar to those of the cold deserts may occur in any latitude at high elevations. The cold deserts differ in many respects from the hot and mid-latitude deserts. Strictly speaking, the cold deserts are humid regions for, although they receive only meager precipitation, the coldness keeps evaporation losses low. The moisture present in cold desert regions is generally unavailable, however, to plant and animal life because of the low prevailing temperatures. The sparse vegetation of the cold deserts consists of low forms, mainly sedges, mosses, and lichens. Typical animals are the arctic hare, arctic fox, arctic wolf, lemming, caribou, and musk ox.

Apart from the regions permanently covered with snow and ice, deserts are the most unfavorable areas on earth for human life. Natural aridity makes them incapable of supporting dense settled populations. Most of the world's deserts, if utilized at all, are devoted to extensive pastoralism, often of the nomadic type. However, where irrigation is possible, the hot and mid-latitude deserts may be exceedingly productive (see IMPERIAL VALLEY) and some of the densest agricultural populations of the world occur in oases. See ARABIAN PENINSULA; ATACAMA; CAMEL; COLORADO DESERT; GOBI DESERT; GREAT AMERICAN DESERT; KALAHARI DESERT; OASIS; SAHARA; SONORAN DESERT; THAR, THE; TUNDRA.

DESERTAS. See MADEIRA ISLANDS.

DESERTION, absence without authority from the military or naval service with intent not to return. A man who enlists in a unit other than his own without being discharged from a regular assignment is also chargeable with desertion, as is one who goes absent without leave with the intention of avoiding hazardous duty or shirking important service.

The articles of war provide that if the offense of desertion be committed in time of war the offender shall "suffer death or such other punishment as a court martial may direct, and if the desertion be committed at any other time, any punishment excepting death that a court martial may direct." The rights of citizenship are not forfeited by conviction of desertion in time of peace, but this penalty follows upon its commission in time of war. A deserter apprehended after his enlistment has expired is subject to court

martial. The thirty-ninth article of war protects him if he is not apprehended before the lapse of three years and if his desertion is in time of peace; in time of war there is no limitation. An enlisted man is usually not carried as a deserter until he has been absent without leave for more than 10 days, but an intent to desert must always be proved regardless of the time absent.

Under the selective service acts of World War I a person registered for military service who failed to report when ordered to do so by a draft board was chargeable with desertion. Under the Selective Training and Service Act of 1940 and subsequent regulations in World War II, however, a drafted man was not subject to military law until he was actually inducted into the military service. See COURTS, MILITARY.

The U.S. articles of war provide that an officer who, having tendered his resignation and prior to due notice of the acceptance of the same, quits his post or proper duties without leave and with intent to absent himself permanently therefrom is a deserter. No such ruling was applied to 313 officers who resigned from the U.S. Army and joined the Confederacy in the Civil War.

Desertion during the Revolution and the War of 1812 was common, but because of much misunderstanding over terms of service, particularly in the militia, little attempt was made to enforce penalties. During the Mexican War desertions totaled 6825, including the San Patricio Corps of Artillerists formed by the Mexicans from U.S. Army deserters, largely Irish, who were persuaded to change sides partly on religious grounds. Some of them were hanged or branded when captured by U.S. forces at Churubusco.

Despite occasional invocations of the death penalty, desertions reached high figures during the Civil War. Total desertions in the Union Army were estimated at 200,000 and in the Confederate Army at 100,000; in the closing days of the war, however, the Confederate armies virtually melted away by desertion. Desertions from the army during the Spanish-American War were 5285; for World War I, 21,282.

Figures for World War II are in no way comparable for two reasons: (1) draft evaders were not classified as deserters, and (2) a majority of cases that in other wars would have been charged as desertions were classified as absence without leave. This occurred largely because the conditions in the occupation of countries in both theaters of war were such that most absentees remained in uniform. The AWOL problem reached large but not serious proportions in Italy, France, Germany, and Japan and in other occupied areas. See MILITARY LAW. DON RUSSELL

DESERTION, in law, willful abandonment of an employment or duty in violation of a legal or moral obligation; also an act by which a man leaves his wife, or a woman leaves her husband. Various actions may constitute desertion. For instance, in the state of Iowa desertion embraces three criminal acts: (1) refusal of a husband to provide for a wife, (2) abandonment of a legitimate child under 16 years of age, and (3) neglect to provide for such child. In all but a few states (Louisiana, New York, and North Carolina) desertion is grounds for divorce. Generally, there must be a cessation of cohabitation without reasonable cause for a period prescribed by statute, intention on the part of the alleged deserting party not to resume cohabitation, and absence of consent to the separation on the part of the alleged deserted party. In some states nonsupport is sufficient to constitute desertion, as is also willful neglect and failure or refusal to provide. It has been held that physical departure from a spouse is not essential to a desertion. On the other hand, desertion is established by denial of sexual relations between husband and wife. Separation plus intent to abandon are generally required to establish desertion.

Generally a deserted wife may pledge her husband's credit for herself and her children, or she may, by summary proceedings or criminal process, compel him to contribute a stated amount for her support and that of the family. A deserted husband is, by his wife's misconduct, freed from the obligation of supporting her, and may, by due notice to tradesmen, prevent her from pledging his credit for food or other necessaries. See ABANDONMENT; DIVORCE; HUSBAND AND WIFE.

DE SEVERSKY, ALEXANDER PROCOFIEFF. See SEVERSKY, ALEXANDER PROCOFIEFF DE.

DESHIMA. See NAGASAKI.

DESICCATION, the process of removing water from substances by making the vapor pressure in the substance greater than that of its surroundings. This may be done either by heating the substance, thereby increasing its vapor pressure, or by decreasing the total pressure over the substance. Since the total pressure is equal to the sum of the pressures of the individual gas molecules, a hygroscopic material (such as sulfuric acid or calcium chloride) that will absorb water molecules from the surrounding air will decrease the total pressure over the substance. The residual water in the substance will then have a greater pressure than its surroundings, escape from the substance, and be absorbed by the hygroscopic material. This process will continue until the hygroscopic material is diluted to the point where it can no longer absorb water. At this point the vapor pressure of the substance will equal the pressure of its surroundings. Desiccation can also be accomplished by mechanically decreasing the pressure with the aid of a vacuum pump or by passing dry air over the moisture-laden substance. In a desiccator (a glass apparatus frequently used to accomplish desiccation mechanically) the bottom of the vessel is covered with a hygroscopic material and the moisture-laden substance is placed upon a porcelain tray separated from the water-absorbing material. A tight-fitting cover protects the enclosed air from atmospheric and humidity variations in the room. Frequently the cover is fitted with a stopcock to permit vacuum desiccation. See HYGROSCOPIC SUBSTANCE; DELIQUESCENCE.

DESIDERIO DA SETTIGNANO, 1428–64, Florentine sculptor, was born in Settignano. One of the outstanding early Renaissance sculptors, he is best known for his marble tomb of Carlo Marsuppini in the Florentine church of Santa Croce. Strongly influenced by Donatello, Desiderio's work includes such delicately carved busts as *Laughing Boy* and *Marietta Strozzi.*

DESIDERIUS, died after 774, the last king of the Lombards. During his rule, 756–774, his daughter was married to Charlemagne. Desiderius' attempt to extend his domain met with opposition from Charlemagne, who marched upon the Lombard capital (now Pavia), captured Desiderius, and sent him to a French monastery where he died. His son, Adalgis, tried unsuccessfully to gain the kingdom for himself.

DESIGN, the arrangement of the basic elements, both material and conceptual, that comprise a man-made object of any kind. Every object, whether two- or three-dimensional, is composed of design elements —those material qualities of an object that give it recognizable and classifiable form. Among the design elements of a chair, for example, are the seat, legs, back, and arms. A designer consciously arranges or rearranges these elements as part of the over-all process of producing the object.

Pure design is but one of the many qualities inherent in an object, and has to do essentially with its form, not comprehending such other possible aspects as style, efficiency, detail, technique of production, or utility. In practice, however, such other aspects play an important role in the work of most designers. Twentieth century designers have recognized that to consider only the pure design of an object is hardly to consider the object at all; and well-trained designers must take into account every facet of the object being designed, even to its sociological and psy-

FRED LYON

BETTMANN ARCHIVE

All suspension bridges are essentially of the same design principle. The simplicity in the design of the primitive rope suspension bridge crossing a comparatively narrow ravine shown in the Japanese drawing at the left is also found in the great bridge at the right that spans the Golden Gate, the entrance from the Pacific Ocean to the San Francisco Bay area.

chological aspects. The degree to which a designer considers appearance, use, and psychological effect depends upon the nature of his assignment and the division of labor involved in a specific over-all production process. Thus, designers normally work in conjunction with engineers, merchandising men, production men, and other specialists who participate in the development of an idea into an object and in making that object available to the consumer.

Most, but not all, paintings are of the same basic design—a flat rectangle on which elements of line and color are placed so as to inspire an aesthetic experience in the viewer. But this description hardly comprehends all the qualities of a painting. The emotions produced, the visual effects, color harmonies, style, impressions of depth, technique, and even the subject painted are not, strictly speaking, design. But the designer of a painting—usually the painter himself—certainly keeps these factors in mind. Another example of design is in the furniture field. A Duncan Phyfe pedestal table of traditional design is similar to a mid-twentieth century pedestal table by Paul McCobb. A rectangular table is quite different in design principle from either pedestal table because it is supported at each corner rather than at the center only. In engineering design, a rope hung across a ravine displays the same basic design as a suspension bridge and a tree felled across a gully the same design in principle as a truss bridge.

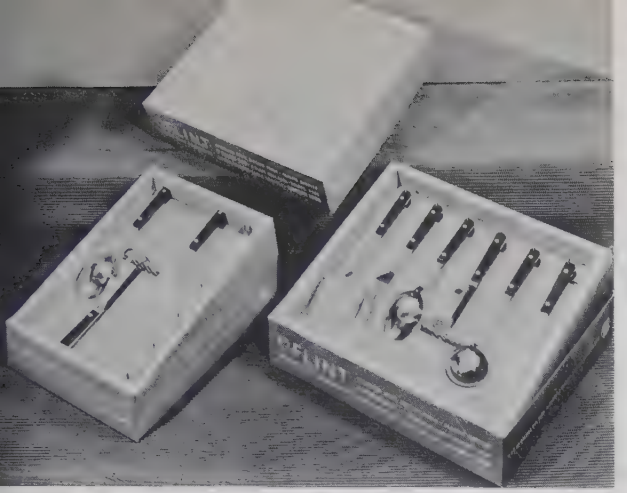
Through the centuries man has worked with and improved design, but often so slowly and subjectively that he was unaware of its existence as a conceptually separate quality of all objects. He often accepted one design answer as final and perfect, and varied this design endlessly, not considering the possibility that another, wholly different basic design might more successfully accomplish his ends.

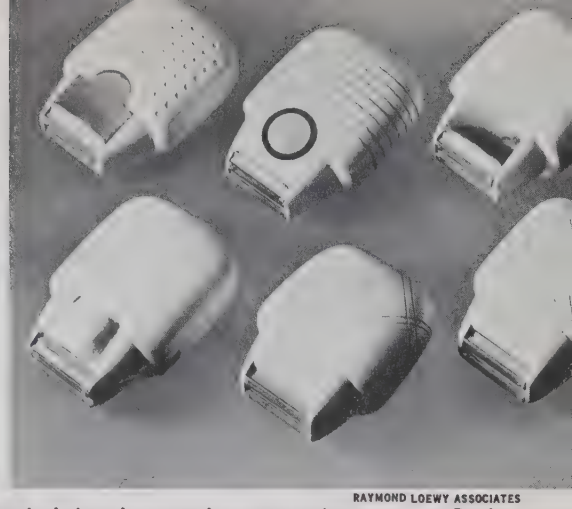
Design improvement requires a certain amount of pure invention, and design changes have usually occurred in steps which, for example, in the development of architectural design can easily be traced. The very earliest structures were simple post and lintel construction, allowing a span the width of a single stone. Then came the arch, allowing loftier and wider spans, using a number of stones arranged together. Then followed the vault—the spatial form of two arches fitted together. And later, the dome—a large, self-supporting structure, simple in concept, but using many stones in a unique integrated design. In the nineteenth century the introduction of steel in construction gave a new form to the post and lintel system, allowing vast spans or extreme height in the case of skeleton structures. Great progress was subsequently made in steel and concrete variations of the vault and dome.

Design has always been an integral part of the production of objects, but twentieth century man separated it from the other activities involved in production and used it to fuller advantage. The process of isolating design from the total problem and studying it, experimenting with it, and drawing a logical conclusion from it, is one of the highest thought processes of modern man. Although the Eskimo probably took centuries to develop the perfect igloo as a solution to his problem of shelter, a modern designer —considering the available materials, tools, and environment—might have arrived at the same solution in much shorter time. Assuming that he had never seen an igloo, the modern designer would examine and test snow for compressive strength and for workability, check wind and snow loads, and probably select the dome as the simplest and most direct structural system for snow blocks. Then he would build and test prototypes and, perhaps in a matter of days, design by logic and test a product that may have taken the Eskimo centuries to develop. Because the modern designer understands the design process, he is able to apply fundamental design principles to the specific design problem. In contrast to design considered in the classical, pure sense, modern design encompasses mechanics as well as aesthetics. Since basic design to a large extent controls appearance the U.S. patent office grants both mechanical and design patents, the latter covering appearance rather than function. The comprehensive approach to problems of design has been stressed by the leaders of the Bauhaus Movement and developments growing out of it (see Schools of Design, following).

Product stylists have found that rearranging or changing components can produce new and exciting appearance. Industrial design and product styling have often been confused. Design is a more basic concept than styling, because styling implies change only in appearance, while design is basic functional change. It is possible to restyle without redesigning, but almost impossible to redesign without causing a nearly complete style change. Styling is a valid means of improving a product's appearance but design can accomplish much more and requires greater ingenuity, inventiveness, mechanical skill, and careful testing for success. Design has come to be a profession in its own right, supported by schools, publications, and societies; no longer is design an almost accidental by-product of craftsmanship or technology. In the twentieth century design applies largely to mass-produced goods, and strives for mass acceptance by consumers.

Role of the Designer. Because of the departmentalization of the various activities of production, the role of the designer in this chain of events can be defined, although its precise nature varies. Design as





RAYMOND LOEWY ASSOCIATES

Good package design, left, not only covers the products protectively but also appeals to prospective customers. Product design, which is illustrated by the electric shavers at the right, is concerned with the shape, surface, weight, balance, and appearance of the instrument. After a design is chosen and before manufacturing begins, exact models are made.

a profession blends into a number of other activities, and peripheral fields such as art, engineering, and crafts should be taken into account. Art is not design because the temperamental approach is very different. Pure art implies free and personal expression, uninhibited by mechanical limitations beyond the production of one piece. If the result is pleasing or desirable to others this is often coincidental rather than purposeful. Design is done for others. If the designer himself is pleased with the result, this is a pleasant but not particularly important by-product of his activity. Engineering usually follows upon design and is the technical working out of the design. Design selects the elements to be calculated and tested by the logic and proofs of engineering. The engineering of a product usually presupposes a design, which engineering refines in terms of such factors as the purpose of the product and production problems.

Design requires the forming of a plan and implies the application of special skills, talent, training, and creativity to accomplish a projected result; the act of designing is usually motivated by some definite human need. The designer's products must perform functionally, be acceptable in appearance, and be susceptible of pricing for mass acceptance. Design, then, is a blend of aesthetics, function, and human relations.

There are three general fields of design: two-dimensional design (graphic design, visual design, or communication design); three-dimensional design (industrial design or product design, interior design, architectural design, and display design); and mechanical design (tool design, aircraft design, and bridge design). The first two fields are more generally called design fields, while the third is often considered a branch of engineering.

Two-Dimensional Design

Two-dimensional design is much concerned with aesthetics, since it is primarily for the communication of some idea or message. Design as applied in the mass media of magazines, newspapers, books, posters, direct mail, packages, brochures, labels, logotypes, television, and motion pictures is included in this category. The psychological reaction of the consumer to the presentation is of utmost importance. The main object is to break through the general apathy of the individual and to deliver the information as quickly, memorably, and unmistakably as possible. For example, soap boxes may be designed to look like a bargain; farm equipment advertisements can appear rugged

This uncluttered interior is the second floor of the Manufacturers Trust Company Bank in New York City.

MANUFACTURERS TRUST—© EZRA STOLLER

LIB. OF CONGRESS

The kitchen of the housewife of the 1870s was designed to center on the coal range and its basic heavy utensils.

and strong; patent medicine packages can look ethical and medically effective; a line of products can have over-all identity in a repeated design that makes the manufacturer seem more important and his products more popular than they may be.

The graphic designer must have a sound working knowledge of lettering, typography, photography, illustration, layout, and the various reproduction processes. In the production of an advertisement, for example, the copy is written and a general theme set. The art director then lays out the advertisement for visual effect. After approval by the client, the advertisement is then parceled out to various specialists for final art. This art is sent to the engraver for plates and then to the publication for printing. Since advertising rates involve large sums of money, design must be effective. Usually graphics are not planned one piece at a time, but in groups to run consecutively over a period of time; these are advertising campaigns. Graphic designers may be free lance, or members of an internal art department. Most large advertising agencies have an art department and an art director who conceives or directs the basic design layout, which is then assigned to specialists, some of whom may work on a free-lance basis. Magazine and book publishers may also have such departments as do many large industrial firms.

Three-Dimensional Design

Three-dimensional design requires a high degree of technical knowledge concerning production processes, combined with a thorough knowledge of basic aesthetic principles and an understanding of consumer needs and desires. The designer must also understand business and marketing practices and have the ability to cope with any given problem in design.

Industrial Design. Often called product design or product styling, industrial design involves the functional and visual improvement of mass-produced articles. Usually these fall into seven general groups: jewelry (and such items as watches, fountain pens, tie clips, and safety razors); minor appliances (sometimes known as traffic appliances, since they can be carried away from the point of sale by the customer) such as clocks, shavers, irons, and fans; major appliances (large items such as ranges, refrigerators, and television sets); transportation vehicles (railroad cars, automobiles, aircraft interiors, buses); capital equipment, that is, items not bought by the general public, such as telephones, office equipment, engine lathes, and steam shovels; housewares (small unpowered items such as egg beaters, pots and pans, plant stands, and kitchen tools); and toys.

Since the main object in the design of manufactured products is to increase user acceptance and satisfaction, these design jobs usually follow a basic pattern. When the need for a new or improved product is sensed, a workable mechanism is created through research, invention, and engineering. This mechanism is then turned over to a designer, who rearranges the components, locates controls, and selects materials on the basis of such factors as appearance, wear, protection. He integrates the object with its environment and styles it for appropriate appearance. This process involves many skilled operations, mechanical drawings, and sketches. Both dummy and working models are made to check the appearance and function of the object before it is put into production. Often models are pre-tested by being shown to consumers to gain their reactions to appearance and use. Because of the great cost involved in producing a new product, its design must be done carefully by experts. A small loss in sales caused by poor function or appearance could result in a tremendous loss to the company in both dollars and reputation.

Industrial designers are sometimes consultants, who are self-employed and sell their services on a fee or retainer basis. They usually have a variety of accounts since they cannot ethically work for competing companies. Corporate designers are employed by a company to design its products only.

Furniture Design. Because of peculiar manufacturing and consumer-acceptance problems furniture design is a highly specialized field. Wood finishes, wood construction, upholstery in mass production, and the preferences of the consumer must be completely understood. It has been estimated that consumers buy furniture 75 per cent on design and style preference and only 25 per cent on function, quality, brand name, or other factors. Furniture designers often design interiors, fabrics, floor and wall cover-

MC CANN-ERICKSON, INC.

Emphasis on automatic equipment and convenient arrangement are elementary in the design of the kitchen of the 1950s.

ings, and lamps and decorative accessories in addition to furniture, but rarely design other products. Industrial designers, however, often handle furniture accounts in addition to accounts for other types of products.

Display Design, particularly in the case of large exhibits or trade show displays, is generally done by firms specializing in this field—mostly by employees of the company, and seldom on a free-lance basis. Where displays (usually called point-of-sale devices) are to be mass produced, they are often designed by industrial designers.

Interior Design. This highly specialized field has to do with the design of interiors of offices, sales areas, public places, and institutions and homes, where the main problems concern circulation of air, durability of materials, maintenance cost, multiple use and sales revenue, and like factors. There is a distinct difference between the interior designer and the interior decorator. The decorator uses existing pieces of furniture, accessories, fabrics, rugs, and the like to complete rooms, usually in households. The interior designer usually does commercial or institutional interiors with complex problems such as designing and supervising special furniture and fixtures, planning space allocations for maximum merchandising effectiveness, including sales analyses and determining traffic flow and control, as well as cost of maintenance. He may even invent or design new materials for durability and new appearance, and often may oversee complete design, building, and installation of large projects such as retail stores, hospitals, schools, hotels, terminals, and office buildings.

Mechanical Design. Such areas as tool design, aircraft design, bridge design, and plumbing design make up the mechanical design field. The mechanical designer selects basic elements and arranges them to perform some technical function. In modern practice such design is a part of various engineering fields. The design is only tentative until the engineering proof verifies its efficiency over other possible designs. Aesthetics does not enter into the selection of com-

METROPOLITAN MUS. OF ART

PARKE-BERNET GALLERIES, INC.

CHARLES EAMES

Three chairs illustrate different conceptions of comfort and elegance. An Italian chair of 1490, left, is decorative but makes no concessions to comfort. The Chippendale chair, center, although cushioned, is stiff and elaborate in design. The contours of the Eames desk or dining chair, at right, are designed to provide comfort for the occupant.

ILL. INST. OF TECHNOLOGY

Building Designed by Mies van der Rohe to House the Department of Architecture at Illinois Institute of Technology

ponents unless there is more than one way of producing an equally efficient result, and in such case the more attractive design will be selected. Bridge designers are usually civil or structural engineers; aircraft designers are aeronautical engineers. See Mechanical Engineering.

Schools of Design

The Bauhaus was the first school that believed designers must be both creative artists and informed technicians. Established in Weimar, Germany, in 1919 by Walter Gropius, it began the systematic training of designers. The faculty was composed of artists, craftsmen, and technicians, in an attempt to synthesize the new profession of design. Its aim was to encourage the proper use of tools and materials in production by investigation and experimentation in basic design processes. The Bauhaus was dissolved in 1929 because of the economic breakdown in Germany, but it had already proved that it was possible to teach design as a professional subject.

During the 1920s three men traveled to the United States from Europe, bringing with them their variations of the successful Bauhaus experiment. Laszlo Moholy-Nagy founded the school that was to become the Institute of Design in Chicago. Alexander Kostelow, after a short stay at Carnegie Institute of Technology, moved on to Pratt Institute, N.Y., where he applied the Bauhaus technique of instruction. Antonin Heythum went to the University of Syracuse. The system of design education these men introduced was basically the same as the Bauhaus method. The first year of training was a foundation year in which students received basic training in drawing and sculpture and, in addition, studied craft techniques, power tool operation, mechanical drafting, and basic structural systems under a plan of problems in aesthetic discipline. They then proceeded to their chosen field of design, becoming more specialized through four- to five-year courses in reproduction technique, experimental design, presentation skills, and marketing. In addition the humanities, psychology, sociology, English, history, mathematics, physics, and economics were studied.

In the United States at mid-twentieth century there were 20 highly qualified schools teaching design—some teaching many fields, others specializing in single fields. Among these were the Rhode Island School of Design; the Institute of Design of Illinois Institute of Technology, Chicago; The Art Center, Los Angeles; Pratt Institute, New York; and the Massachusetts Institute of Technology, Boston. Many leading U.S. designers such as Raymond Loewy, Melanie Kahane, Walter Dorwin Teague, and T. H. Robsjohn-Gibbings made notable contributions to the establishment of design as a profession, as did the eminent architects Frank Lloyd Wright and Ludwig Mies van der Rohe. See Architecture; Art Education; Costume; Decorative Arts; National Academy of Design.

Jay Doblin

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MEANING OF THE MAGNA CHARTA

It Has Become Famous Symbol of Rights of Man

No political document has greater symbolic appeal than the Magna Charta (now commonly spelled *Carta* in Britain), or Great Charter. Its very name—Magna Charta—has an impressive sound. Its history, the circumstances under which it was formulated, the manner in which cruel, conniving King John was compelled to accept it, the difficulties encountered in enforcing it, the meanings read into it, and its glorification by generations of devotees of democracy—all are dramatic in the highest degree. In fact, the combination suggests a pageant touching upon more than seven centuries of political development.

The barons of England had suffered many wrongs under John's predecessors, Henry II and Richard I, as well as under John himself. So when, in October, 1214, John returned from a military defeat at the hands of the French, determined to exact funds from these barons, they met him unitedly with a demand for a charter of their rights. And they asked that it be based on the one granted them by Henry I.

John bluffed, was evasive, tried various tricks. However, the barons, under the leadership of Cardinal Stephen Langton, archbishop of Canterbury, held firm. Negotiations continued for months, but finally on June 15, 1215, at Runnymede, the stubborn monarch reluctantly affixed his seal to a preliminary draft of the renowned document. Amendments were made within the next four days. John accepted these also, affixing his seal to all copies of the finished charter on June 19, 1215.

Enforcing the provisions of the Great Charter was, however, another matter. The attempts to do this and the maneuvers employed to annul and get around it make a long story involving plots and counterplots. But more important than all of that is the significance that the charter has had for later generations.

Primarily it affirmed certain rights of the English barons and earls. But it also proclaimed the freedom of the church. Moreover, incidental to protecting the liberties of the barons, it set definite limits to the authority of the king. In addition it provided precedents for trial by a jury of one's peers, habeas corpus, regular courts, and no extraordinary taxation without consent.

Some commentators have gone to great pains to explain that those who drafted the Magna Charta did not intend it to be a charter of general human rights. Whether they did or did not, subsequent generations have interpreted its declarations as laying the basis for certain rights which have come to be regarded as fundamentals of democracy. See Bill of Rights; Constitution, *Great Britain;* Democracy in Practice; England, History, *The Birth of Magna Charta;* Feudal Society; Henry III; John; Langton, Stephen; Magna Charta; Runnymede.

A.H.WINKLER
English Barons
COMPEL KING JOHN
TO SEAL THE
MAGNA CHARTA
RUNNYMEDE • JUNE 15 • 1215